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A REVIEW OF THE SCORPÆNOID FISHES OF JAPAN.

BY

DAVID STARR JORDAN
AND
EDWIN CHAPIN STARKS,
Of the Leland Stanford Junior University.

From the Proceedings of the United States National Museum, Vol. XXVII, pages 91–175 (with Plates I–II).

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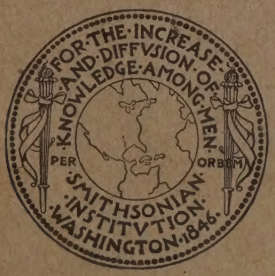

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A REVIEW OF THE SCORPÆNOID FISHES OF JAPAN.

By David Starr Jordan and Edwin Chapin Starks,
Of the Leland Stanford Junior University.

In this paper is given a review of the species of *Scorpænidæ* known to inhabit the waters of Japan. The specimens examined are in the museum of Leland Stanford Junior University and in the United States National Museum, most of them having been collected by Messrs. Jordan and Starks in 1900 and a few by the United States Fish Commission steamer *Albatross*.

Family SCORPÆNIDÆ.

Body oblong, more or less compressed, the head large, and with one or more pairs of ridges above, which usually terminate in spines; sometimes very irregular in form. Opercle usually with 2 spinous processes; preopercle with 4 or 5. Mouth terminal, usually large, with villiform teeth on jaws and vomer, and usually on the palatines. Premaxillaries protractile; maxillary broad, without supplemental bone, not slipping under preorbital. Gill openings wide, extending forward below; the gill membranes separate and free from the isthmus; usually no slit behind the fourth gill. Scales ctenoid, or sometimes cycloid, usually well developed, sometimes obsolete. Lateral line single, continuous, concurrent with the back; a narrow bony stay extending backward from the suborbital toward the preopercle. Ventral fins thoracic, usually of the normal percoid form, I, 2, to I, 5, the rays branched; dorsal fin continuous, sometimes so deeply notched as to divide it into two parts, or even three parts, with 8 to 16 rather strong spines and about as many soft rays; anal rather short, usually with 3 spines and 5 to 10 soft rays; soft rays in all the fins usually branched, except some or all of rays of the pectorals; pyloric cæca in moderate or small number (less than 12). Pseudobranchiæ large. Air bladder present or absent. Actinosts moderate, inserted on the posterior edges of hypercoracoid and hypocoracoid; ribs borne on enlarged pleuraphyses. Post-temporal bifurcate, normally connected; myodome more or less developed. Genera and species numerous,

inhabiting all seas, but especially abundant in the temperate parts of the Pacific Ocean, where they form a large proportion of the fish fauna. They are nonmigratory fishes, living about rocks. Most of them are of large size, and all are used as food. Many of them are viviparous, the young being produced in great numbers when about one-fourth inch in length. Many of them have a venom sac at the base of the dorsal spines. In Japan the olivaceous species are known as *Mebaru* (pop eye), the others as *Soi* or *Aka–uwo* (red fish). Numerous species with venomous spines are known as *Okoze*.

a. Dorsal fin beginning well backward at the nape, far behind the eye.
  b. Body scaly, sometimes with fleshy flaps; no free rays on the pectoral; ventral rays always I, 5.
    c. Pectoral fin with its lowermost ray not detached as a separate feeler.
      d. Dorsal spines not greatly produced with slender free tips; pectoral fins moderate.
        e. SEBASTINÆ. Dorsal spines more than 12; vertebræ more than 10 + 14.
          f. Dorsal spines 15 or 16; vertebræ about 11 + 18 = 29; palatine teeth present; scales ctenoid; top of head scaly.
            g. Pectoral with the lower rays produced in a distinct lobe; anal rays III, 5 ..... *Sebastolobus*, 1.
          ff. Dorsal spines 13 (rarely 14); vertebræ usually 12 + 15 = 27; palatine teeth present.
            h. Head and lateral line without series of filaments.
              i. Preorbital stay without series of hooked spines.
                j. Base of skull strongly curved; interorbital space broad, flat, or convex; cranial spines relatively low; gill-rakers relatively long ..... *Sebastodes*, 2.
                jj. Base of skull nearly straight; interorbital space narrow, mostly concave; cranial spines relatively sharp and high; gill-rakers short and thick ..... *Sebastichthys*, 3.
              ii. Suborbital stay and preopercle with a row of strong hooked spines; dorsal spines very strong and long .. *Neosebastes*, 4.
            hh. Head and lateral line with many dermal filaments; preorbital stay without enlarged spines ..... *Thysanichthys*, 5.
        ee. SCORPÆNINÆ. Dorsal spines normally 12; vertebræ 10 + 14 = 24.
          l. Bones of head scarcely cavernous; occiput with two pairs of spines; scales ctenoid, or else provided with dermal flaps; some of the pectoral rays branched.
            m. Scales on top of head ctenoid; cranium essentially as in *Sebastodes;* the armature moderate, and no deep pits; palatine teeth present.
              n. Air bladder well developed ..... *Sebastiscus*, 6.
              nn. Air bladder obsolete ..... *Helicolenus*, 7.
            mm. Scales on top of head cycloid or wanting; no air bladder; cranium irregular above, with many spines.
              o. Palatine teeth present ..... *Scorpæna*, 8.
              oo. Palatine teeth none ..... *Scorpænopsis*, 9.
          ll. Bones of head with large muciferous cavities; scales cycloid; pectoral rays usually 20 or more, some of them branched; head scaleless above; no groove at occiput; palatine teeth present; scales deciduous.
            p. Dorsal spines 12; interorbital space wide and convex; gill-rakers short and slender .. *Setarches*, 10.

pp. Dorsal spines 11; interorbital space concave; gill-rakers slender, rather long; dorsal very deeply notched..... *Lythrichthys*, 11.

dd. Pteroinæ. Dorsal spines 12 or 13 in number, greatly produced, venomous; pectoral fins more or less elongate; top of head with spinous crests; three anal spines; no palatine teeth.

q. Pectoral greatly elongate, all the rays simple, largely free at tips, and extending to or beyond the caudal; no bony crests at the nape. *Pterois*, 12.

qq. Pectoral moderately produced, the rays united by membrane nearly to the tips.

r. Each side of occiput with an elevated bony crest..... *Ebosia*, 13.

cc. APISTINÆ. Pectoral fin elongate, its lowermost ray detached; chin with barbels; dorsal with 15 spines; anal spines, 3; ventral rays I, 5 .. *Apistus*, 14.

bb. Body scaleless, sometimes with dermal flaps.

s. MINOINÆ. Dorsal spines, 10 or 11; the fin undivided; pectoral moderate, with the lower ray free; ventral rays I, 5; anal with 2 slender spines; top of head with spinous crests.

t. Dorsal spines stiff and sharp.. *Minous*, 15.

tt. Dorsal spines slender and flexible. *Decterias*, 16.

ss. Dorsal spines 15 to 18 in number; head irregularly formed, with deep pits or depressions above.

u. SYNANCEINÆ. Pectoral without free rays; body robust.

v. Skin smooth; no pit on the cheek ventrals I, 4..... *Erosa*, 17.

uu. PELORINÆ. Pectoral with the two lower rays almost free; first 3 spines of dorsal separated; head depressed, fantastically formed.

w. Pectoral fin without produced filaments above..... *Inimicus*, 18.

aa. APLOACTINÆ. Dorsal fin beginning farther forward, the first spines inserted above the eye; the spines provided with venom glands; pectoral fin without free rays; scales small or wanting.

x. Ventral rays I, 5; preorbital with a strong spine; skin smooth.

y. Mouth small; palatine teeth present; dorsal fin with 16 spines..... *Ocosia*, 19.

yy. Mouth large; palatine teeth obsolete; dorsal fin with spines; no slit behind last gill; chin without barbels. *Snyderina*, 20.

xx. Ventral rays I, 2, to I, 4.

z. Preorbital with a strong spine.

a'. Skin with small scales, or almost naked; dorsal fin not notched; no barbels; no slit behind last gill; palatine teeth present; anal with 3 spines; ventral rays I, 4..... *Paracentropogon*, 21.

a'a'. Skin scaleless, covered with velvety prickles; no barbels; no slit behind last gill; palatine teeth absent; ventral rays I, 2, or I, 3.

b'. Dorsal fin undivided; anal with two spines..... *Erisphex*, 22.

zz. Preorbital without spine; spinous dorsal deeply notched, the first three spines separated; no palatine teeth; no anal spine; ventral rays I, 2.

Aploactis, 23.

1. SEBASTOLOBUS Gill.

Sebastolobus GILL, Report, Smithsonian Institution, 1880, p. 375 (1881), (*macrochir*).

Pectorals with a wide base, produced backward near the upper margin and not medially, lower rays thickened, extending much beyond rays next above in a linguiform lobe; ventrals directly under axils of pectorals, with the outer rays produced, thick, branched; anal III, 5; vertebræ 11+18=29; otherwise as in *Sebastes*. Pacific Ocean in deep water.

(σεβαστός, *Sebastes;* λοβός, lobe.)

1. SEBASTOLOBUS MACROCHIR (Günther).

BALA MENUKE (THORNY POP-EYES).

Sebastes macrochir GÜNTHER, Shore fishes Challenger, 1880, p. 65, pl. XXVII; off Enoshima in 345 fathoms.

Sebastolobus macrochir JORDAN and EVERMANN, Fish. North and Middle Am., II, 1898, p. 1763.

Head 2½ in length; depth 3¼. D. XV, 6; A. III, 5; P. 22 (1_5^7). Lat. line, about 45. Scales rather regular. Eye very large, much longer than snout, 3 in head. Mouth wide, maxillary reaching beyond middle of eye. Teeth on mandibles, vomer, and palatines in very narrow bands, those on premaxillaries in somewhat broader bands. Interorbital space flattish, narrow, scaleless, about 2½ in orbit. Occipital region flat, with some rudimentary scales. Preocular, supraocular, postocular, tympanic, parietal, and nuchal spines present. Interorbital stay with strong spines. Preopercle with 5 pointed spines. Each ramus of mandible with 3 large pores. Dorsal spines rather feeble, third to sixth longest, 2½ in head. Anal spines stronger, but shorter than longest dorsal spines. Caudal truncate. Pectoral extremely broad, 5 or 6 lower rays elongated beyond those above them, their extremities somewhat thickened, and used like the similar outer ventral rays, as an organ of locomotion. Pectorals reaching vent, ventrals beyond vent. Red, a large black spot on posterior half of spinous dorsal, another between anal spines. Length about a foot.

Coast of Japan at moderate depths; often taken on the long lines (dabonawa) at 200 to 400 fathoms. Our specimens from Miyako and Misaki, and Nemuro in Hokkaido. It was also dredged by the U. S. Fish Commission steamer *Albatross* in Station 3697, off Manazura Point, Sagami Bay, in 265 to 120 fathoms, these figures representing the depths at the beginning and end of the dredge-haul.

(μακρός, long; χεῖρ, hand.)

2. SEBASTODES Gill.

ROCK-FISHES.

Sebastodes Gill, Proc. Ac. Nat. Sci. Phila., 1861, p. 165 (*paucispinis*).
Sebastosomus Gill, Proc. Ac. Nat. Sci. Phila., 1864, p. 147 (*melanops*).
Acutomentum Eigenmann and Beeson, American Naturalist, 1893, p. 669 (*ovalis*).
Primospina Eigenmann and Beeson, American Naturalist, 1893, p. 669 (*mystinus*).
Rosicola Jordan and Evermann, Check-List Fishes North and Middle Amer., 1896, p. 429 (*pinniger*).
Eosebastes Jordan and Evermann, Check-List Fishes North and Middle Amer., 1896, p. 430 (*aurora*).
Emmelas Jordan and Evermann, Fish. N. and M. Am., 1898, p. 1777 (*glaucus*).

Body and head somewhat compressed; head large, $2\frac{2}{5}$ to $3\frac{2}{5}$ in length of body; depth $2\frac{1}{4}$ to $3\frac{3}{4}$ in length of body; mouth moderate or large, with the jaws equal or the lower more or less projecting; the maxillary reaching middle of eye or beyond, sometimes beyond posterior edge of orbit, its length from $1\frac{3}{4}$ to 3 in head; teeth in villiform bands on jaws, vomer, and palatines. Head more or less evenly scaled, without dermal flaps; interorbital space broad, convex, widening markedly with age; base of skull strongly curved; cranial ridges more or less developed, one or more of the following pairs always present, usually ending in spines: Preocular, supraocular, postocular, tympanic, coronal, parietal, and nuchal. Five preopercular and 2 opercular spines; 1 to 3 spines on the suprascapula. Suborbital stay moderate, usually not reaching preopercle. Gill rakers always long and slender. Scales moderate or small, mostly ctenoid, 35 to 100 transverse series. Dorsal fin continuous, emarginate, its formula XIII, 12 to 16, the number of spines rarely 14, never 12; anal fin III, 5 to 9. Pectorals well developed, the base broad or narrow, the lower rays undivided. Caudal slightly rounded, truncate, or slightly forked; soft parts of vertical fins more or less scaly. Pyloric cæca 6 to 11. Vertebræ 12+15. Species of varied, often brilliant colors, mostly red. Sexes colored alike. Air bladder present in all species so far as known. The group inhabits the two shores of the northern Pacific Ocean; some of the species are extremely localized; exceedingly abundant in rocky places along the west coast of the United States and Japan. They seem to disappear rather abruptly to the southward on both coasts; the number of species dwindles northward; none are Arctic

and none tropical, the bulk of the group inhabiting temperate waters. The vertical range of most of the species is rather limited; some live in and near tide water, and a few species have been taken at a depth of 1,600 feet. All are ovoviviparous, bringing forth great numbers of young, which are nearly one-half inch in length when born. The species differ greatly in form and armature, and in the extension of the bones of the cranium, but the genera based on these differences intergrade too closely to admit of definition, notwithstanding the great differences which appear on comparison of extreme forms.

(*sebastes*, εἶδως, resemblance; *Sebastes* is from σεβαστός, magnificent.)

a. EMMELAS. Dorsal spines 14; skull thick, with small spines; color dull brownish; peritoneum black ..... *glaucus*, 2.

aa. Dorsal spines always 13.

b. Cranial ridges, except parietal, all obsolete, or very slightly developed; lower jaw much projecting.

c. Scales moderate, 40 to 55 pores in lateral line. Parietal bones usually meeting.

d. PRIMOSPINA. Peritoneum black; lower jaw projecting with a symphyseal knob; anal rays III, 7.

e. Body moderately elongate, compressed; the depth 3 to 3¼ in length.

f. Tubes in lateral line 45; mandible naked; maxillary scaly, 2⅕ in head. Color warm brown, shaded and mottled with darker; all the fins, except pectoral and caudal, distally black ..... *taczanowskii*, 3.

ff. Tubes in lateral line, 54; mandible scaled; maxillary scaled, 2$\frac{1}{10}$ in head; pectorals scarcely reaching vent; color creamy brown; lateral line in a pale streak; opercle with a black blotch ..... *itinus*, 4.

ee. Body ovate, compressed, the depth 2⅔ in length; scales large, 30 pores in lateral line; mandible not scaled; maxillary scaly, reaching posterior border of eye; pectorals reaching front of anal. Color creamy olive green, orange-tinged below; orange streaks about eye; back in a pale streak; clouded with dusky; lateral line a dark, opercular blotch; fins blackish edged ..... *steindachneri*, 5.

dd. SEBASTOSOMUS. Peritoneum white, color blackish or bronze-greenish.

g. Anal rays III, 8.

h. Pores of lateral line 50; mouth moderate, the maxillary 2½ in head; eye 3½ in head; pectoral reaching tips of ventrals; not to front of anal; color blackish with dark cross-bands; fins all black; depth 2¾ in length ..... *güntheri*, 6.

hh. Pores of lateral line 45; mouth larger, the maxillary 2⅓ in head; eye 3 in head; pectoral reaching front of anal; color dull brassy green; maxillary usually with a dark stripe; depth 2⅔ in lengthe ..... *inermis*, 7.

gg. Anal rays III, 7; pores 45; body slender; the depth 2⅝ in length; pectoral very long, reaching beyond ventrals to front of anal; mouth moderate; eye 3 in head. Color dusky, white below; fins edged with dusky, the pectorals colorless ..... *tokionis*, 8.

bb. Cranial ridges somewhat developed, most of them present and ending in a slender spine; lower jaw projecting; parietals usually not meeting.

i. ACUTOMENTUM. Lower jaw much projecting, with a symphyseal knob.

j. Second anal spines not much if any longer than third.

k. Peritoneum white. Scales small, about 48 pores in lateral lines; depth $2\frac{2}{3}$ in length; pectorals about as long as head, about reaching anal; maxillary not reaching middle of eye. Color red, with 5 blackish cross-bands ..... *joyneri*, 9.

kk. Peritoneum black; scales large, the pores about 30; color deep red, inside of gill cavity black.

l. Teeth in narrow bands on jaws and on palatines; jaws scaly.

m. Pectoral reaching base of third anal spine; ventrals reaching vent; a dusky shade on opercle.... *matsubaræ*, 10.

mm. Pectoral not reaching anal fin; ventrals not to vent, a dusky spot on side of body..... *iracundus*, 11.

ll. Teeth in single series on sides of jaws and on palatines; maxillary $2\frac{1}{2}$ in head; pectoral reaching front of anal. *flammeus*, 12.

jj. Second anal spine longer than third; scales large, 28 pores in lateral line; depth $2\frac{1}{2}$ in length, pectorals shorter than head; maxillary reaching just past middle of eye. Peritoneum dusky. Color red, with brownish clouds or cross shades. *scythropus*, 13.

ii. ROSICOLA. Lower jaw little projecting; scales not large; maxillary reaching hinder margin of orbit.

n. Supraocular spine wanting; nasal, preocular, postocular, tympanic and parietal spines present; jaws scaleless; pectoral about $1\frac{1}{2}$ in head. Color dusky, with irregular darker cross blotches and spots; fins broadly edged with blackish; dark shades across cheeks; pores about 46 (60 to 70 series of scales above lateral line) ..... *fuscescens*, 14.

2. SEBASTODES GLAUCUS (Hilgendorf.)

Sebastes glaucus HILGENDORF, S. B. Ges. Naturf. Freunde, 1880, p. 170; Yezo.
Sebastodes glaucus JORDAN and GILBERT, Rept. U. S. Fur Seal Comm., III, 1898, p. 447; Bering Island.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 1777; Bering Island.

Head $3\frac{1}{3}$ in length; depth $2\frac{3}{4}$; eye $4\frac{2}{3}$ in head, $1\frac{1}{5}$ in snout; interorbital width $3\frac{2}{5}$ in head. D., XIV, 16; A., III, 8. Lateral line with 56 pores. Highest dorsal spine $2\frac{1}{3}$ in head, thirteenth spine $4\frac{2}{5}$, fourteenth spine $3\frac{2}{3}$; second anal spine $3\frac{4}{5}$, third anal spine $3\frac{1}{5}$, longest soft ray of dorsal $1\frac{3}{10}$. Crown and occiput very broad, more convexly arched than in any other species known to us. Nasal spines low, but strong. Ocular ridge low, evident only above front of eye; occipital ridges barely evident, evenly scaled over; top of head otherwise without spines, ridges, or furrows, the even convex curve unbroken. Vertical distance from middle of interorbital space to upper edge of orbit equaling one-half vertical diameter of orbit. Anterior margin of preorbital with 2 rounded lobes which do not bear spinous points; preopercular spines very strong, the upper 2 closely approximate, the others widely separated, all the spines sharp pointed, the uppermost very wide at base, the second much narrower, the others short and

wide; upper 2 spines directed backward, the 3 lower downward and backward; opercular spines strong, flat, often bifid or trifid; spines on adjacent angles of subopercle and interopercle sometimes bifid; behind these on margin of subopercle a few short spinous points. Gill rakers very long and slender, 11 + 29 in number, the anterior 1 or 2 of lower arch tubercular, the longest (22 mm.) more than two-thirds diameter of orbit. Mandible very heavy, the symphysis not produced, the 2 jaws subequal. Vomerine and palatine patches of teeth extremely narrow. Fins high, the third to seventh dorsal spines subequal; caudal very slightly emarginate; anal spines graduated; pectorals scarcely reaching vertical from vent, the lower 9 simple, the 10 upper forked; ventral not reaching vent, two thirds length of head. Caudal scaled to tip on membranes and rays; soft dorsal and anal with narrow bands of scales following the rays to or nearly to their tips, the membranes of the first 3 or 4 rays in each fin wholly scaled on basal third; spinous dorsal naked; pectorals scaled on basal half; ventrals naked; head, the maxillary and mandible, the branchiostegal rays, the anterior and upper half of interopercle, and all of preorbital except a minute area along its posterior margin, naked. The body is covered with small weakly ctenoid scales, largely covered over by the extraordinarily developed accessory scales; scales on breast; belly, and prepectoral area smooth. The naked skin covering bones of head is minutely wrinkled or papillose. Color in spirits, light brownish on body and fins, with darker shades on lips, gill membranes, opercles, and top of head; it may have been reddish in life; mouth and gill cavity white; peritoneum jet-black. Here described, after Jordan and Gilbert, from one specimen 49 cm. long, from Bering Island. The identification is made with some doubt, owing to lack of any detailed description of the type, a dried specimen from Yezo, and to some minor discrepancies between the two. Our specimen has 56 (not 49) tubes in the lateral line, the nasal spine is small but not properly to be called rudimentary, the dorsal notch seems somewhat deeper, and the second anal spine somewhat shorter. North Pacific; two specimens known, the one from Hokkaido, in the museum of Berlin, the other from Bering Island, in the United States National Museum.

(*γλαυκός*, hoary blue.)

3. SEBASTODES TACZANOWSKII (Steindachner).

Sebastodes taczanowskii Steindachner, Sitzb. Akad. Wiss. Wien, 1880, p. 256, pl. II, fig. 1 (dorsal XIV, 13); Bays of the Gulf of Strielok, near Vladivostok, Japan Sea.—Jordan and Gilbert, Rept. U. S. Fur Seal Comm., III, 1898; Shana Bay, Iturup Island.—Jordan and Evermann, Fishes N. M. Amer., II, 1898, p. 1831; after Steindachner and Jordan and Gilbert.

Head 2⅝ in length; depth 3. Dorsal XIII, 13; anal III, 7. Tubes of lateral line 45. Body not much elevated. Mouth moderate; maxillary nearly reaching vertical from posterior edge of pupil, 2¼ in head.

Lower jaw projecting. Teeth in rather narrow bands, developed in a slight knob at tip of lower jaw. Eye a little longer than snout, 3¾ in head. Interorbital space rather wide and slightly convex, its width scarcely less than diameter of eye. Nasal and preocular spines present, supraocular ridge very slightly developed, sometimes ending in a tiny spine on one or both sides, usually absent. Crown and occiput evenly convex, and without spines or ridges. Preopercular spines diverging, the lowest pointing downward, the highest backward. Preorbital with 2 rounded lobes, no spines. Gill rakers long and slender, the longest, half the diameter of the eye. Caudal truncate or very slightly emarginate.

Scales rough ctenoid. Maxillary and preorbital with tiny embedded scales. Mandible naked.

Color warm brown above and on sides, paler brown below; obscure shadings of darker brown on upper part of sides; many scales with basal or central area darker; opercles with a dusky shade; no dark streaks on head; fins brown, all except the pectorals and caudal becoming distinctly black on distal portion; lining of buccal and gill cavities white, but with a narrow dark streak along each side of floor of mouth anteriorly; peritoneum brownish black, uniformly and densely pigmented.

This species, a near ally of the Aleutian *Sebastodes ciliatus* and of the American *S. mystinus*, is very abundant in northern Japan. Our many specimens are from Otaru, Mororan, Iwanai, Aomori, and Same.

(Named for Professor Taczanowsky).

4. SEBASTODES ITINUS Jordan and Starks, new species.

YANAGI-NO-MAI (MAID OF THE WILLOWS).

Head 3⅜ in length; depth 3⅓; eye 4 in head; snout 4; maxillary 2 1/10; interorbital 4. Dorsal XIV, 13; anal III, 7; pores of lateral line, 54.

Mouth rather large, the maxillary reaching a little past posterior margin of pupil. Lower jaw strongly projecting. Symphyseal knob prominent. Teeth coarse and sharp, in narrow bands on jaws, vomer and palatines. A knob of teeth developed on front of mandible, which shuts outside of maxillary teeth. Interorbital evenly convex, the superorbital rim not raised. Nasal spines very small, but sharp. Preocular spines represented by very blind, inconspicuous lobes; other spines absent. Occipital ridges scaled over and scarcely discernible. Edge of preorbital slightly scalloped, but without spines. Preopercular spines evenly spaced, the next to the uppermost the largest, the two lowest directed downward. Gill rakers very slender, the longest ⅔ eye, 26 on outer limb of arch.

Pectoral rays 19, the lower 10 unbranched. They reach slightly past tips of ventrals, but scarcely to vent. Dorsals low, the longer spines equal to the anterior or longest rays. The longest spine 2½ in

head, the next to the last $\frac{3}{4}$ eye; the last equals eye. When fin is depressed, the next to the last spine reaches along the basal third of the last. Tips of last dorsal rays reach to within half the diameter of the eye of the base of upper axillary caudal rays. Second anal spine not nearly so long as third, its length equal to eye. First spine one-third eye. Caudal concave.

Scales strongly ctenoid on body and top of head, less strongly on cheeks. Fine scales on mandible, preorbital, and maxillary. Pectoral, ventrals, soft dorsals, and caudal, with fine scales nearly to tips of rays, basal half of anal with scales. Peritoneum black.

Color creamy brown; top of head and upper part of sides clouded

FIG. 1.—SEBASTODES ITINUS.

with dusky; lateral line running in a conspicuous light streak. Upper part of opercles with a black spot.

This species is known from a single example taken at Hakodate, 27 cm. in length. It much resembles the "Willow-maiden," *Sebastodes steindachneri*, differing from it in having smaller scales, a more slender body, a smaller mouth, scales on mandible, and many minor characters. It is an ally of *Sebastodes entomelas*.

Type.—No. 7368, Ichthyological collections, Leland Stanford Junior University Museum.

(*ἰτεῖνος*, of the willow, in allusion to the common name Yanagi-no-mai.)

5. SEBASTODES STEINDACHNERI (Hilgendorf).

AKA SOI (RED ROCK-FISH); YANAGI-NO-MAI (WILLOW-MAIDEN).

Sebastes steindachneri HILGENDORF, S. B. Ges. Natur. Freunde, Berlin, 1880, p. 172, with plate; Yezo.—JORDAN and EVERMANN, Fish. N. M. Am., II, 1898; p. 1830, copied.

Head $2\frac{5}{6}$ in length; depth $2\frac{2}{3}$. Dorsal XIII, 14; anal III, 7. Eye 4 in head; snout 4; interorbital $4\frac{1}{2}$. Lateral line with 30 pores.

Mouth large, the maxillary reaching to posterior edge of orbit. Lower jaw strongly projecting, a knob developed at symphysis. Teeth

rather coarse, in narrow bands, developed in a knob at front of mandible. Interorbital space slightly and evenly convex, superorbital rim not raised. No spines on head except nasal. Ridges absent except at occiput, where they are but very slightly evident. Spines of preopercle all pointing backward, the next to the upper one the largest. Preorbital with 2 obtuse spines. Gill rakers long and slender, three-fifths in diameter of eye.

Pectoral rather broad and rounded, reaching past tips of ventrals to vent or to front of anal; 18 rays, the lower 9 unbranched. Ventrals not reaching vent; ventral spine three-fifths of length of soft rays. Dorsal spines rather low, a little lower than soft rays; the fourth to eighth subequal, $2\frac{2}{5}$ in head, next to last spine $3\frac{1}{2}$; last spine 3; when fin is declined, the next to last spine reaches about two-thirds the distance to tip of last spine. Dorsal rays reach well past tips of anal rays (when fins are declined) and nearly to base of auxiliary caudal rays. Caudal slightly concave. Second anal spine stouter and as long or a little longer than third, length $2\frac{1}{3}$ to $2\frac{1}{2}$ in head; first spine 5 in head, scarcely reaching to middle of second. Scales everywhere strongly ctenoid; mandible naked; maxillary and preorbital with fine scales. Peritoneum black.

Color of fresh specimen: Light olive green, verging on golden below and orange-tinged on breast. Dull orange stripes radiate from eye. Jaws fleshy pink, the lips golden, the maxillary with a yellow streak. Dark olive clouds on body, the lateral line pink. Dorsal clouded olive, pinkish at tip with blackish edging. Pectoral pink, yellow olive at base. Ventral yellow olive with pink on first rays and blackish at tip. Anal spines pink, the rays bright yellow olive. Caudal bright olive, pinkish above and below. In the preserved specimens the color has almost entirely disappeared; the back is clouded with dusky; the opercular spot is conspicuous, but with blended edges, and the lateral line is in a conspicuous light streak cutting through the dusky pigment of black.

We identify our specimens with those of Dr. Hilgendorf, with some doubt. Hilgendorf describes orbit $3\frac{1}{2}$ in head, three-fourths in snout (4 in head in our specimens, and equal to snout). The ocular and tympanic spines rudimentary (entirely absent in our specimens), and mandible and preorbital naked (preorbital with scales in our specimens). Here described from two specimens 20 and 24 cm. in length.

This very handsome species, known as Yanagi-no-mai or willow-maiden, is rather rare in the markets of Japan. Our two specimens are from Hakodate. This species very much resembles *Sebastodes ovalis* of California, having, however, larger scales. Its black peritoneum, long gill rakers and smooth head show its relationship to *Sebastodes taczanowski* and *Sebastodes glaucus*.

(Named for Dr. Franz Steindachner.)

6. SEBASTODES GÜNTHERI Jordan and Starks, new species.

Head 3⅕ in length; depth 2¾. Dorsal XIII, 14; anal III, 8. Pores of lateral line, 50; 17 scales in a vertical series running upward and backward between anal spine and lateral line; 12 between lateral line and last dorsal spines; mouth not large, the maxillary reaching a little past a vertical line passing through middle of pupil 2½ in head; chin strongly projecting and entering into profile of head, its lip with a knob of teeth; teeth in narrow bands; orbit longer than snout 3½ in head. Interorbital convex, of moderate width, almost equal to diameter of eye. Ridges of head low and ending in small but sharp spines. Nasal, preocular, supraocular, and parietal spines present. Preopercular spines all directed backward, the upper one very small, the next

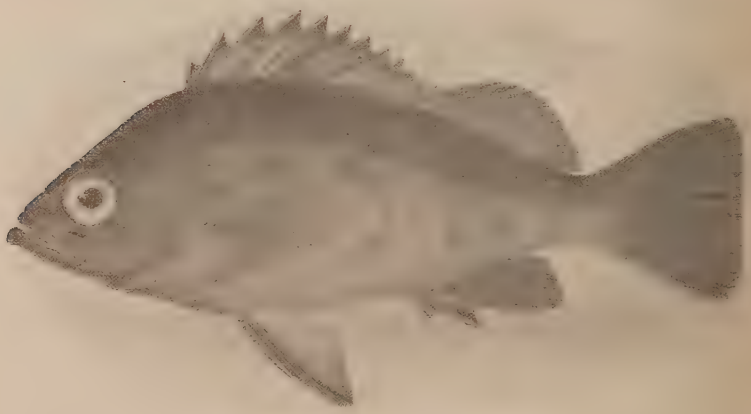


FIG. 2.—SEBASTODES GÜNTHERI.

by far the largest. Gill rakers slender, the largest slightly exceeding half the diameter of eye, 26 on anterior limb of arch.

Pectoral reaching to tips of ventrals, or scarcely to front of anal. Ventrals rather long, ventral spine reaching two-thirds of length of longest rays. Anal not nearly reaching to base of auxilary caudal rays when depressed. Second anal spine stronger and a little shorter than third—2⅓ times longer than first. Dorsal spines moderate, the fourth 2 in head, the last two-fifths longer than the one preceding it. Soft dorsal rays about equal to spines in length. Peritoneum white. Color black on back and sides, dusky silvery below. Sides with 4 broken irregular cross-bars. Fins all black.

Here described from the type, from Wakanoura, 7½ inches in length.

This species is closely related to *Sebastodes inermis*, differing from it in having smaller scales and eye, shorter maxillary, wider interorbital and longer ventral spine, as compared with ventral rays.

Other specimens were taken at Misaki, Wakanoura, and Hakodate.

Type.—No. 7372, Ichthyological collections, Leland Stanford University Junior Museum. Cotypes are No. 50904, U.S.N.M.

(Named for Albert Günther.)

*7. SEBASTODES INERMIS (Cuvier and Valenciennes).

KURO-SOI (BLACK ROCK-FISH).

Sebastodes inermis Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 346; Japan.—Günther, Cat., II, 1860, p. 97.—Hilgendorf, Sitzungb. Bericht. Gesell. naturf. Freunde, Berlin, 1880, p. 172.—Steindachner and Döderlein, Fische Japans, III, 1884, p. 205; Tokyo.—Jordan and Evermann, Fish. N. M. Am., II, 1898, p. 1829 (after Steindachner).

Sebastes ventricosus Schlegel, Fauna Japonica, Poiss., 1845, p. 48, pl. xx, figs. 1, 2; Nagasaki.—Bleeker, Verh. Bat. Gen., XXVI, p. 80; Nagasaki.—Günther, Cat. Fish, II, 1860, p. 87.—Nystrom, Kong. ver. Handl., 1887, p. 20; Nagasaki.

Sebastodes ventricosus Jordan and Evermann, Fish. N. M. Am., II, 1898, p. 1829 (copied).

Sebastodes fuscescens Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, pp. 745–756; Tsushima (not of Houttuyn).

Head 2⅞ in length; depth 2⅔. Dorsal XIII, 14; anal III, 8. Pores of lateral line 43; 14 scales in series, running upward and slightly backward, between anal spines and lateral line, between last dorsal spines and lateral line.

Body deepest at first dorsal spines. Head pointed. Tip of lower jaw strongly projecting and entering into upper profile. Mouth moderate, maxillary nearly reaching vertical from posterior edge of pupil; 2⅔ in head. Teeth in narrow bands, developed in a knob at tip of lower jaw. Orbit much longer than snout, 3 in head. Interorbital convex, rather narrow, two-thirds of diameter of orbit. Ridges on head low and little developed, ending in small, sharp spines lying close against the skin: nasal, preocular, supraocular, and parietal spines present. Two spines on shoulder and 2 on opercle. Preopercle spines all directed backward. Preorbital with 2 spines directed downward and backward. Gill rakers long and slender, the longest a little less than half orbit; 24 on anterior limb of arch.

Pectoral 1⅓ in head, reaching to tips of long ventrals, nearly to above front of anal. Ventrals long and slender, the spine reaching little more than halfway to tip of first ray. Anal, when depressed, reaching to, or nearly to, auxiliary caudal rays, the third spine a little longer and weaker than second; the first half length of second. Dorsal spines moderate, the fourth about 2 in head; the last one-third longer than the one preceding it, which scarcely reaches the middle of last when fin is depressed. Soft dorsal rays as long or longer than the spine. Peritoneum white. Color, brassy green, pale or dusky. Maxillary usually with a stripe.

Here described from specimens from Tokyo, 20 to 23 cm. in length.

This species is very abundant in southern Japan, by far the most common representative of the genus. It is the only one often seen in the markets of Nagasaki and it is abundant even so far north as Tokyo. It is well figured by Schlegel as *Sebastes ventricosus*. Our specimens are from Hakodate, Matsushima, Tokyo, Misaki, Enoshima, Kobe, Onomichi, Hiroshima, Wakanoura, Nagasaki, and Tsushima.

The nearest American ally of this species is *Sebastodes flavidus*.

(*inermis*, unarmed.)

8. SEBASTODES TOKIONIS Jordan and Starks, new species.

Head $2\frac{5}{6}$ in length; depth $2\frac{5}{6}$. Dorsal XIII, 14; anal III, 7. Pores of lateral line 45; 14 scales in a series, running upward and backward between anal spines and lateral line; 9 between lateral line and posterior dorsal spines.

Mouth moderate, maxillary extending to below middle of eye, tip of lower jaw strongly projecting and entering into upper profile of

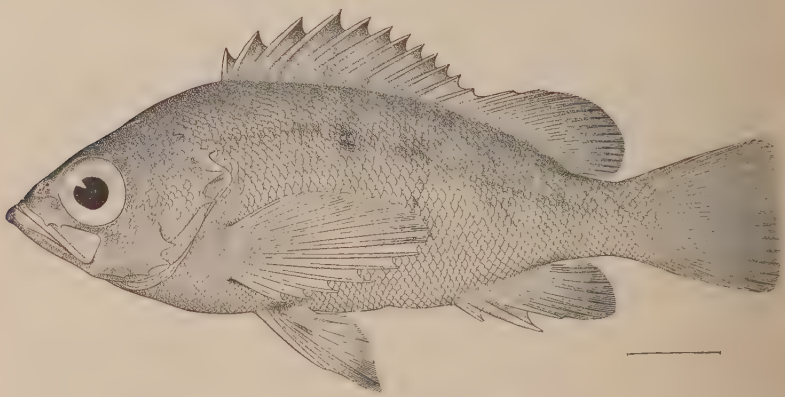


FIG. 3.—SEBASTODES TOKIONIS.

head. Teeth in narrow bands, developed in a knob at tip of mandible. Eye large, its diameter 3 in head. Interorbital slightly convex, three-fourths diameter of eye. Ridges of head low; nasal, preocular, supraocular, and parietal present. Preorbital with two spines, the anterior one triangular, the posterior one rather sharp and directed downward and backward. Gill rakers slender, two-fifths of eye, 26 on anterior limb of arch.

Pectoral long and slender, reaching well past tips of ventrals to above front of anal. Ventral spine three-fifths the length of soft rays. Ventrals not reaching to anal. Dorsal spines not high, equal to height of soft rays, the fourth spine $2\frac{1}{4}$ in head. Anal scarcely reaching to auxillary caudal rays when depressed, the third spine a little longer and more slender than the second. Peritoneum white.

Color silvery below, dusky on back. Dorsals, anal, and tips of ventrals dusky; pectoral colorless.

This species is known to us from numerous specimens taken at Tokyo, Wakanoura, Tsuruga, and Misaki. It is very close to *Sebastodes inermis*, differing in the longer pectoral, more slender form, and longer ventral spines. Here described from the type from Misaki.

Type.—No. 7369, Ichthyological Collections, Leland Stanford Junior University Museum. Cotypes, No. 50905, U.S.N.M.

(Tokyo, at the capital.)

9. SEBASTODES JOYNERI (Günther).

TOKENOKO MEBARU (BAMBOO-SPROUT ROCK-FISH).[a]

Sebastes joyneri Günther, Ann. and Mag. Nat. Hist., I, 1878, p. 485; Japan; Challenger Report, Shore Fishes, 1880, p. 64, pl. xxix, fig. A.

Sebastodes joyneri Jordan and Evermann, Fish N. M. Am., II, 1898, p. 1829, after Döderlein.—Jordan and Snyder, Check List, 1901.

Sebastes inermis Hilgendorf, S. B. Gesell. Naturf. Freunde, Berlin, 1880, p. 172, with plate.—Steindachner and Döderlein, Denksch. Akad. Wiss. Wien, 1884, p. 206 (not of Cuvier and Valenciennes).

Head 3 to 3⅓; depth 2⅔; D. XIII, 14 or 15; A. III, 7; P. 16 (10–6); lateral line 45 to 49 (pores); orbit 3; snout 4¼; interorbital width, flat, unbroken by ridges, 4 in head. Mouth moderate, oblique; projecting lower jaw with symphyseal knob. Teeth delicate, sharp, in narrow bands, tip of mandible developed in a knob, which fits in a notch in upper jaw and projects above maxillary teeth. Maxillary not quite reaching middle of eye. Preorbital broad, with 2 strong spines directed downward and backward. First (uppermost) spine of preopercle a little weaker than the fifth; second longest, the others decreasing rapidly in length. Opercular spines parallel, the upper stronger. Maxillary, under side of lower jaw. Preorbital and greater part of snout (nearly whole head except lips) scaled. Pores of lower jaw inconspicuous. Ridges of head very low, ending in acute spines. Nasal preocular, supraocular, and occipital spines present. Gill rakers, half eye in length, 25 on anterior limb of arch. Fourth to sixth dorsal spines longest, 2⅓ in head; second anal spine stronger but equal to third in length, 2⅓ in head. Pectoral somewhat pointed toward tip, as long as or only a little shorter than head, reaching beyond vent or even to origin of anal. Ventral and caudal 1½ in head, the latter slightly concave; basal half of spinous dorsal with minute scales; whole of soft dorsal, anal, and caudal completely scaled. Color in life (Döderlein), red, darker on the back; 5 blackish cross bands running upon dorsal fin and ending below (except second and third) at lateral line; last 2 bands short, rounded; the longest 2, middle bands somewhat interrupted, each sometimes forming 2 spots.

[a] This fish is reputed delicious when boiled with bamboo sprouts.

Peritoneum white. Here described from a specimen 9 inches in length from Tokyo.

This handsome species is known to us by several specimens from Aomori, Miyako, and Tokyo. It is rather rare, living in water of some depth, its nearest American ally being *Sebastodes proriger*.

(Named for Mr. Joyner, who collected for the British Museum in Japan.)

10. SEBASTODES MATSUBARÆ (Hilgendorf).

Sebastes matsubaræ HILGENDORF,[a] Sitzb. Gesell. Naturf., Freunde, 1880, p. 170; Hondo.

Sebastodes matsubaræ JORDAN and EVERMANN, Fish. N. M. Amer., II, 1898, p. 1833, after Hilgendorf.

Head $2\frac{3}{5}$ in length; depth $2\frac{1}{2}$. Dorsal XIII, 13; anal III, 7. Pores of lateral line 32. Eye $2\frac{3}{4}$ in head; maxillary $2\frac{1}{6}$. Interorbital width $4\frac{1}{2}$. Lower jaw slightly projecting. Symphyseal knob prominent. Teeth fine and sharp, in very narrow bands, developed in a knob at tip of mandible which fits in a notch in premaxillaries. Maxillary reaching to below middle of eye. Snout two-thirds eye, interorbital rather wide, three-fifths the diameter of eye, deeply concave, the supraorbital edges not abruptly raised as ridges; along its middle are a pair of weak ridges with a shallow rather wide channel between them. Cranial ridges scarcely developed except parietal ridges, which are very high and sharp. Cranial spines moderate in size and sharp. Preocular, supraocular, postocular, tympanic, parietal, and nuchal spines present. Preorbital with an anterior broad rounded lobe and 2 spines. Preopercle spines sharp and the 2 upper ones rather slender; the lowest are directed downward, the next 2 downward and backward, and the 2 uppermost backward. Two opercular spines, the upper one long, sharp, and slender. Gill rakers long and slender, one-third eye, 22 on anterior limb of arch.

Pectoral rather slender, reaching to above base of third anal spine; number of rays 19, the lower 10 simple and not much thickened. Ventrals covering vent, not reaching anal. Fifth dorsal spine equal to length of soft dorsal rays, which are equal or very slightly exceed diameter of orbit. Next to the last dorsal spine $4\frac{1}{4}$ in head; last $3\frac{1}{2}$. Second anal spine stronger, slightly shorter and more curved than third, its length $2\frac{4}{5}$ in head; first spine half as long. Caudal slightly concave.

Scales strongly ctenoid. Mandible, preorbital, and maxillary with fine scales. Fine scales cover soft fin rays nearly to their tips. Peritoneum jet black, inside of gill covers dusky.

[a] The specimens from the Aleutian Islands in Pallas's collection (No. 8145, Mus. Berlin) referred by Dr. Hilgendorf to *S. matsubaræ*, belong to *Sebastodes aleutianus* Jordan and Gilbert, an allied species with smaller scales and lower spines.

Color in life bright red; in spirits colorless or flesh color; the fins without markings; the upper part of opercle shows traces of a diffuse dusky blotch.

This species is known to us only from specimen 28 cm. in length taken with the long lines at Misaki. It is an ally of *Sebastichthys alentianus*.

(Named for Shinnosuke Matsubara, director of the Imperial Fisheries Institute in Tokyo.)

11. SEBASTODES IRACUNDUS Jordan and Starks, new species.

Head $2\frac{2}{5}$ in length; depth $2\frac{1}{5}$. Dorsal XIII, 13; anal III, 8. Pores of lateral line 30. Eye $3\frac{1}{4}$ in head; maxillary $2\frac{1}{2}$; interorbital width 5.

Snout blunt. Lower jaw projecting and with a large symphyseal knob. Mouth large; maxillary not quite reaching to below posterior

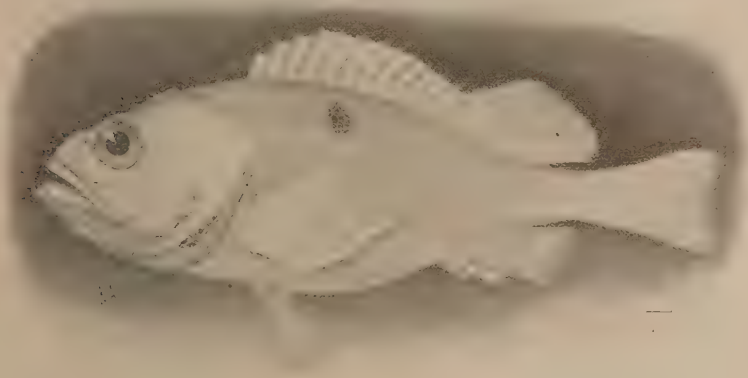


FIG. 4.—SEBASTODES IRACUNDUS.

orbital rim. Teeth rather sharp, set in narrow bands at sides of jaws, and becoming much wider anteriorly; tip of mandible with a small knob of teeth which fits in a notch in premaxillaries; vomer with a narrow V shaped patch; palatines with a short narrow patch. Cranial spines without ridges except at occiput, where they are sharp, but rather low. Spines very slender, but sharp. Nasal, preocular, postocular, tympanic, parietal, and (on one side) nuchal spines present. Preorbital with 3 lobes, the anterior one broadly rounded, the other 2 angulated, but without spines. The 3 upper preopercular spines closer together than the others; the next to the uppermost the largest; all directed backward. The 2 lower ones directed downward and backward. Gill rakers two fifths diameter of orbit; 21 on anterior limb of arch.

Pectoral reaching just past vent, but not to anal fin; its lower 9 rays simple, 11 branched rays. Ventrals not reaching to vent by a distance

equal to three-fourths diameter of eye. Fifth dorsal spine $3\frac{1}{2}$ in head; not as long as the longest soft rays; twelfth spine $5\frac{1}{4}$ in head; thirteenth $4\frac{3}{5}$. Third anal spine longer and much slenderer than second, $3\frac{1}{2}$ in head; second 4; first barely half second. Caudal probably concave.

Scales rough ctenoid. Head entirely scaled to tip of snout, small scales on branchiostegal rays, isthmus, and hyoid bones above branchiostegals. Small scales on lower two-thirds of spinous dorsal, on three-fourths of pectoral, on ventrals including ventral spine, and on basal half of anal, soft dorsal, and caudal. Peritoneum dusky, inside of gill covers black.

Color bright red; in spirits colorless, with no markings except a jet-black spot just above lateral line below the base of the sixth or seventh dorsal spine, its diameter on one side about half that of eye, on the other side about a fourth this size.

The type is a large specimen 55 cm. in length, numbered 12716, Ichthyological Collections Leland Stanford Junior University Museum.

This species is known from this specimen, taken at Kushiro in Hokkaido, and presented to us by Professor Mitsukuri.

It is nearer *Sebastodes alutus* and *Sebastodes aleutianus* than to any other of the American species.

(*iracundus*, red with wrath.)

12. SEBASTODES FLAMMEUS[a] Jordan and Starks, new species.

Head $2\frac{2}{5}$ in length; depth $3\frac{1}{4}$. Dorsal XIII, 14; anal III, 8. Eye $3\frac{3}{5}$ in head; maxillary $2\frac{1}{5}$; interorbital width $4\frac{2}{3}$.

Body not much elevated. Lower jaw strongly projecting and with a large knob at symphysis. Teeth sharp and curved, set in a single irregular row at sides of lower jaw, in a narrow band at front, and in a large knob at tip which shuts entirely outside of premaxillaries; premaxillaries with wide toothless space at front, a narrow band of teeth at sides, which grows slightly under anteriorly, and inside of other teeth on each side of toothless area is a conspicuous knob of large curved teeth pointing irregularly but inward. Vomerine teeth in a narrow band; palatine teeth in a single row. Maxillary reaching to below posterior margin of pupil. Interorbital space flat with 2 median ridges, between which is a shallow rather narrow channel. Cranial spines small and except occiput not preceded by ridges. Preocular, supraocular, postocular (on one side), tympanic, and parietal spines present; the last preceded by very sharp moderately high ridges. Preorbital with 3 lobes without spines. Preopercle spines sharp and slender, the upper 3 directed backward. Gill rakers long and slender, the longest two-fifths diameter of eye, 21 on anterior limb of arch.

Pectoral long and slender, reaching to front of anal, number of

[a] See illustration on p. 175.

rays 19, the lower 8 simple. Fifth dorsal spine $2\frac{3}{4}$ in head, thirteenth $3\frac{1}{4}$. Third anal spine much longer than second, and but little slenderer, 3 in head; second spine $3\frac{1}{2}$; first spine one-half second.

Inside of gill covers and peritoneum dusky; body and fins entirely red.

The type is a badly preserved specimen 33 cm. in length. No scales remain and the length of the soft rays can not be ascertained. It is numbered 7365, Ichthyological Collections Leland Stanford Junior University Museum. It is very close to *Sebastodes iracundus*, but may be known at once by the character of the teeth.

This deep-red species is known to us from a single example taken in deep water at Misaki by Kumakichi Aoki.

(*flammeus*, flame-red.)

13. SEBASTODES SCYTHROPUS Jordan and Snyder.

Sebastodes scythropus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 360, pl. xv; Misaki (No. 49406, U.S.N.M. Coll. K. Otaki).

Head, measured to end of opercular flap, $2\frac{3}{5}$ in length; depth, $2\frac{1}{2}$; depth of caudal peduncle, $3\frac{1}{2}$ in head; eye, $2\frac{3}{5}$; snout, 5; maxillary, $2\frac{1}{2}$; interorbital space, $4\frac{1}{3}$; height of longest dorsal spine, $2\frac{1}{5}$; longest ray, $2\frac{2}{3}$; anal spine, $2\frac{2}{5}$; ray, $2\frac{1}{5}$; pectoral, $3\frac{1}{6}$ in length; ventrals, $4\frac{1}{2}$; caudal, $4\frac{3}{4}$; D. XIII, 13; A. III, 6; pectoral rays, 8 + 8; scales in lateral line, 31; pores, 28.

Eye very large; round; high in head; nearer tip of snout than to posterior edge of opercle, a distance equal to interorbital width. Interorbital area convex; with a median longitudinal groove, deepest anteriorly, growing shallower and wider posteriorly; the groove bounded laterally by a pair of low, rounded ridges. Mouth, oblique; maxillary extending to a vertical through a point a little posterior to center of pupil; lower jaw with a slender, symphyseal knob which projects in a line with upper contour of head. Teeth on vomer and palatines; symphyseal patch of teeth of lower jaw elevated, fitting into a median toothless notch of the upper jaw; palatine bands narrow. Gill-rakers long and slender; 10 + 24 on first arch. Head strongly armed; preocular, postocular, and occipital spines large and sharp; preceded by prominent ridges; tympanic spine acute; smaller than postocular; nasal spines well developed; preorbital with 2 strong spines directed downward; above these an indistinct lobe; preopercle with 5 large spines; the upper 3, of which the second is longest, project backward; the lower 2 project downward and backward; a subopercular and an interopercular spine closely approximated; 2 large, flat, acute spines on upper part of opercle; 2 small, humeral spines. Head, completely scaled; lower jaw, maxillary, and preorbital area with very small scales; dorsal, anal, caudal, and ventral fins with small scales extending almost to tips of spines and rays; pectorals less extensively scaled; all the scales except those on fins and branchiostegals ctenoid. First dorsal

spine shortest; equal in length to width of interorbital space; second equal in length to ninth and tenth; third to sixth twice as long as first; interspinal membranes deeply incised. Longest dorsal rays as long as third spine. First anal spine a little less than half as long as second, somewhat more than half as long as third; second spine strong. Edge of caudal concave; 8 lowermost rays of pectoral simple; uppermost simple ray, in middle of fin, longest, extending to a vertical through insertion of anal. Ventrals extending to vent. Color, in alcohol, light red, with brownish, cloud-like blotches of irregular shape, a blotch equal in width to half the diameter of orbit extending from insertion of dorsal downward to lower edge of interopercle, the brownish color darker on upper part of opercle; a patch of dark color on upper median part of body, spreading over posterior two-thirds of spinous dorsal, extending posteriorly below base of soft dorsal, and reaching upward on anterior part of the latter fin; a dark band on posterior dorsal part of caudal peduncle.

This species is known only from the original types taken at the mouth of the bay of Tokyo, and a third specimen taken with long lines off Misaki. It is related to *Sebastodes hopkinsi* of the California coast. (σκύθροπος, pouting, having a protruding lower lip.)

14. SEBASTODES FUSCESCENS (Houttuyn).

KURO SOI (BLACK ROCK FISH.)

Sparus fuscescens Houttuyn, Verh. Holl. Maats. Wet. Harlem., XX, Pt. 2, 1872, p. 340; Nagasaki.

Sebastes inermis Schlegel, Fauna Japonica Poiss., plate; not of Cuvier and Valenciennes.

Sebastes schlegelii Hilgendorf, S. B. Gesell. Naturf. Freunde, 1880, p. 171, with plate; Tokyo, Hakodate. Steindachner and Döderlein, Fische Japans, II, Wien, 1884, p. 202; Tokyo, Strielok, Hakodate.

Sebastodes schlegeli Jordan and Evermann, Fish. N. and M. Am., II, 1898, p. 1834; after Steindachner.

Sebastodes nigromaculatus[a] Günther, Ann. Mag. Nat. Hist., 1873, p. 377; Chi-fu, China, coll. Mr. Swinhoe.

Sebastodes hakodatis Jordan and Snyder, Proc. U. S. Nat. Mus., 1901, p. 361, pl. xiv; Hakodate (No. 49394, U. S. Nat. Mus., Coll. *Albatross*).

[a] Dorsal XIII, 12; anal III, 8; lateral line 75 (pores doubtless much fewer).

Height of body a little less than length of head, and one-third total (without caudal). Scales rather irregular. Upper surface of head scaly, flat, with very low, plain ridges, without prominent spines. Superciliary edge not elevated; width of interorbital one-fifth length of head. Lower edge of preorbital and preoperculum with acute spines. Maxillary reaching nearly to vertical from hind margin of orbit. The fifth, sixth, seventh (or the fourth, fifth, sixth) dorsal spines longest, longer than anal spines and not half length of head. A deep notch between dorsal fins.

Brownish or greenish brown, with numerous irregular, black spots about as large as pupil; an oblique brown streak from lower part of eye toward the angle of the perculum; fins black, 7⅓ inches long. (Günther.)

This species described, from the Chinese side of the Sea of Japan, seems to be identical with *Sebastodes fuscescens*.

Head $2\frac{2}{3}$ in length; depth $2\frac{1}{4}$; depth of caudal peduncle $3\frac{2}{3}$ in head; eye $4\frac{2}{3}$; snout 4; maxillary $2\frac{2}{3}$; interorbital space $4\frac{1}{2}$; height of longest dorsal spine $2\frac{2}{3}$; longest ray $2\frac{2}{3}$; anal spine $3\frac{1}{3}$; ray $2\frac{1}{6}$; length of pectorals 4 in length; ventrals 5; caudal $4\frac{1}{2}$; D. XIII, 12; A. III, 7; pectoral rays 10–8; scales in lateral line 54; pores 46.

Eye moderate in size; nearer tip of snout than to posterior edge of opercle, a distance equal to its diameter. Snout equal in length to diameter of eye. Lower jaw projecting; symphysial knob scarcely noticeable. Maxillary extending to a vertical through posterior edge of orbit. Bands of teeth on jaws, palatines, and vomer; palatine bands as wide as those on lower jaws. Gill-rakers, 6-17; those on upper part of arch short and blunt; others long and slender. Interorbital space a little convex; interorbital ridges very low, rounded. Head not strongly armed, the spines all lying close to the surface; nasal, preocular, postocular, and tympanic spines minute, sharp; occipital ridges low, rounded, terminating in small, acute spines; preorbital with three flat, sharp spines which project downward; preopercle with five flat, rather blunt spines; two opercular and two humeral spines present. Preorbital area, maxillary, lower jaw, and branchiostegals naked; subopercle and lower and posterior edges of preopercle with cycloid scales; other parts of head with small ctenoid scales; those of the interorbital area extending forward to nasal spines; breast and belly with cycloid scales; other parts of body with ctenoid scales, the edges of which have minute bristles; most of body with minute accessory scales wedged in between the larger ones; spinous dorsal, except a small space on posterior ventral part, naked; other fins with minute scales, which are closely packed at the bases, extending outward along the membranes. Dorsal fins continuous, though having a dividing notch; interspinous membranes deeply incised; first and twelfth spines contained three and one-third times in length of maxillary; fourth to seventh spines longest; tenth and thirteenth spines of equal length; second and third dorsal rays longest. Anal fin rounded, first spine a little less than one half the length of second; second and third spines of equal length, the second much stronger. Pectoral rounded, the lower eight rays simple. Ventrals pointed when depressed. Edge of caudal slightly convex. Color, in alcohol, dark, with scarcely noticeable irregular blotches on upper parts; fins broadly edged with darker color; an indistinct light band on pectoral.

A number of smaller specimens (co-types No. 6271, Leland Stanford Junior University Museum), from the same locality as the type, are much lighter in color, with small, irregular brown spots scattered over the body. In many individuals the spots are collected together, forming four or five indistinct lateral bands; all have three or four dark lateral bands radiating downward and backward from the orbit. The fins show more or less dark color, the pectoral and caudal often being distinctly barred.

One specimen has well-developed coronal spines, but is otherwise indistinguishable from the others.

This species is extremely common in northern Japan, its range coinciding with that of *Sebastodes taczanowskii*. Our numerous specimens are from Otaru, Iwanai, Aomori, Same, Mororan, and Hakodate, where it is especially abundant.

But one species of this type is represented in our collections, *hakodatis* and *schlegelii* being the same, and apparently identical with the *Sparus fuscescens* of Houttuyn. If the scales in the type of *S. hakodatis* are counted so as to give the subvertical series above lateral line, there would be 60 to 68 as described for *S. schlegelii*.

Of the California species, this most resembles *Sebastodes atrovirens*.

(*fuscescens*, growing dusky.)

3. SEBASTICHTHYS Gill.

Sebastichthys Gill, Proc. Ac. Nat. Sci. Phila., 1862, p. 329 (*nigrocinctus*).
Sebastomus Gill, Proc. Ac. Nat. Sci. Phila., 1864, p. 147 (*rosaceus*).
Pteropodus Eigenmann and Beeson, Amer. Nat., 1893, p. 670 (*maliger*).
Auctospina Eigenmann and Beeson, Amer. Nat., 1893, p. 670 (*auriculatus*).
Hispaniscus Jordan and Evermann, Check List Fish. N. M. Amer., 1896, p. 431 (*rubrivinctus*).

This genus is closely allied to *Sebastodes*, being connected with it by an almost continuous series of species. As a whole it differs in the nearly straight base of the skull, the convex interorbital space, and the short, thick, gill-rakers. All these characters are subject to large variation, and while the Japanese species are well defined, there are some American species intermediate between the two groups. Species of this type are found also on the coasts of Chile and of Cape Colony.

(σεβαστός, magnificent; ἰχθύς, fish.)

a. Pteropodus. Supraocular spine wanting; scales large; pores 30 to 40; jaws scaleless or nearly so; peritoneum white.

b. Gill rakers relatively long and slender, 2½ to 3 in diameter of eye; 14 to 16 on lower part of arch. Lower jaw not projecting.

c. Color brown, with marblings and spots of darker brown and white; usually a darker cross shade under each half of dorsal ..... *vulpes*, 15.

cc. Color dusky brown, nearly uniform, covered by snowy spots; second anal spine enlarged ..... *nivosus*, 16.

ccc. Color bright greenish yellow, with an irregular dark shade above and below, leaving lateral line in a dark streak; a dark shade along base of dorsal; dark shades across cheek ..... *trivittatus*, 17.

bb. Gill rakers relatively short and thick, 4 to 5 in diameter of eye, 10 to 14 on lower part of arch; fins usually much spotted.

d. Interorbital area flat, rather wide and scaly.

e. Cranial ridges rather low; scales small; 40 to 65 pores in lateral line; body rather elongate, little compressed, its depth 3 in length; eye small, 5 in head. Color gray, clouded, or barred and spotted with dark; soft fins with small spots; cheek with dark bars.

f. Scales 59 to 65; over 50 pores in lateral line ..... *oblongus*, 18.

ff. Scales 45 to 50; about 40 pores in lateral line ..... *mitsukurii*, 19.

ee. Cranial ridges high and rather blunt; body stout, the depth 2½ in length; pectoral broad, reaching front of anal. Color blackish, usually with yellow areas, one under each dorsal; lower parts and fins usually but not always profusely spotted with dark ..... *pachycephalus*, 20.

dd. Interorbital area narrow, deeply concave, with a deep channel between two raised ridges; dorsal spines often 14; cranial spines rather high. Color gray, much mottled and barred with reddish, fins all barred and mottled; anal spines scarlet in life. Color more variegated than any other species, the size smaller ..... *elegans*, 21.

15. **SEBASTICHTHYS VULPES** (Steindachner and Döderlein).

Sebastes vulpes Steindachner and Döderlein, Fische Japans, III, 1884, p. 203, pl. II; Tokyo.

Sebastodes vulpes Jordan and Evermann, Fish. N. and M. Amer., II, 1898, p. 1835; after Steindachner.

Head 2⅖ to 2½ in length; depth 2¾. Dorsal XIII, 13; anal III, 7; lateral line with 32 pores. Nasal, preocular, postocular, tympanic, and parietal spines moderately developed; eye 4 to 4⅖; snout 4; interorbital space 5 in head. Maxillary reaching posterior margin of orbit; lower jaw scarcely projecting, without distinct symphyseal knob. Lower border of broad preorbital with 3 blunt lobes; the 2 lower opercle spines broad, blunt, the 3 upper more slender, sharp, the 2 opercular spines strongly diverging; upper end of interopercle, especially in older individuals, with a spine; lower end of subopercle with a weaker spine which sometimes divides into several. Snout, anterior part of preorbital, and lower jaw scaleless; a few very small scales on maxillary behind and under preorbital (sometimes absent); rest of head thickly covered with rough scales. Several pores on each side under lower jaw. Interorbital space nearly flat, with very weak interorbital ridges. Gill rakers rather long and slender, the longest two-fifths of eye; 21 on anterior of arch. Upper profile rises moderately, slightly curved at the snout. Fifth dorsal spine longest, 2⅖ in head. Second anal spine stronger, but sometimes a little shorter than third, 2½ in head in small individuals, nearly 3 in larger ones. Pectoral equals head without snout, reaching vent in adults, a little beyond in young; ventral 1⅗ to 1¾ in head; caudal equaling ventrals, slightly convex. Scales moderately large, with some accessory scales. Peritoneum white.

Body, dorsal, anal, and caudal fins mingled reddish brown and whitish; pectoral and ventral grayish; upper half of head reddish brown, strewn with small dark-brown spots which posteriorly almost unite in wavy stripes, or marked like body; lower side of head and body whitish yellow. Sometimes a distinct broad ½ bar of dark brown under middle of spinous dorsal and a less distinct one under soft dorsal.

This large and strongly marked species is rather rare in Japan. Our specimens are from Hakodate, Same, and Miyako in Rikuchu. It is an ally of *Sebastichthys maliger*.

(*vulpes*, fox.)

16. SEBASTICHTHYS NIVOSUS (Hilgendorf).

GOMA SOI (SPECKLED ROCKFISH), KESHIMUYO.[a]

Sebastes nivosus STEINDACHNER and DÖDERLEIN, Fische Japans, III, 1884, p. 202, pl. VII; Tokyo, Hakodate.

Sebastodes nivosus JORDAN and EVERMANN, Fish. N. and M. Amer., II., 1898, p. 1834, after Steindachner.

Head $2\frac{2}{3}$ in length; depth $2\frac{3}{4}$. Dorsal XIII, 12; anal III, 7; lateral line pores, 36; cranial edges and spines well developed. Nasal, preocular, postocular, tympanic, and parietal spines present. Upper profile slightly convex to beginning of dorsal. Eye and snout $4\frac{2}{5}$, interorbital space $5\frac{1}{2}$ in head. Maxillary reaching to posterior rim of orbit, in older individuals somewhat farther. Inferior border of preorbital with 3 more or less rounded lobes, the last angulated, but without a spine. Interorbital space between the elevated supraocular ridges weakly convex. Head entirely scaled, except jaws, snout (in front of nostrils), preorbital, and nearly the whole of interopercle; scales of head small, firm, rough, with accessory scales like those on body. Preopercular spines short, broad, and blunt. Gill rakers moderate in length, one-third of eye, 16 in number on anterior limb of arch. Pectoral rays 18, the lower 10 unbranched, its length $1\frac{1}{2}$ in head, its tips reaching past tips of ventrals; ventral more than $1\frac{3}{5}$ in head; caudal equaling ventral, slightly convex; 36 pores on body, 2 to 3 on base of tail. Peritoneum white. Blackish brown, with innumerable small white dots on body and fins. In some individuals the uniform dark brown of body is interrupted by lighter shades.

This beautifully marked species is not very common in Japan. Our specimens are from Same and Misaki. It is somewhat related to *Sebastichthys nebulosus*, but is well distinguished by the profuse starry spots.

(*nivosus*, snowy.)

17. SEBASTICHTHYS TRIVITTATUS (Hilgendorf).

SHIMA SOI (STRIPED ROCKFISH).

Sebastes trivittatus HILGENDORF, S. B. Gesell. naturf. Freunde, Berlin, 1880, p. 171, with plate; Yezo, Japan.

Sebastodes trivittatus JORDAN and EVERMANN, Fish. N. and M. Amer., II, 1898, p. 1834, after Hilgendorf.

Head $2\frac{3}{5}$ in length; depth $2\frac{3}{5}$; eye 5 in head; snout 4; maxillary $2\frac{1}{6}$; interorbital width $5\frac{1}{2}$. Dorsal XIII, 14; anal III, 7. Pores of lateral line 39.

Mouth large, the maxillary reaching to posterior border of eye. Lower jaw slightly shorter. Symphyseal knob very small. Teeth in rather broad bands. Interorbital slightly concave. A pair of ridges run longitudinally near middle of interorbital space, between which is

[a] Marked with unshaven tufts, as on a child's head.

a narrow channel. Cranial ridges and spines strong. Nasal, preocular, postocular, tympanic, and parietal spines present. Edge of preorbital with 2 rounded and an angulated lobe, but without spines. Preopercle spines well developed, the next to the uppermost the largest. Gill rakers of moderate length, 16 of them on anterior limb of arch, the longest two-fifths of eye.

Dorsal spines a little lower than soft rays, the longest $2\frac{1}{4}$ in head; the next to the last $4\frac{1}{5}$; the last $3\frac{1}{2}$. Notch between dorsals rather deep. Pectoral broad, reaching past ventrals to above front of anal, 17 rays, the lower 8 simple. Ventrals usually reaching vent. Second anal spine stronger and as long, or sometimes a little shorter, than third; length of first spine half second. Inclined anal rays reach base of auxiliary caudal rays; dorsal rays reach slightly past. Caudal rounded.

Scales strongly ctenoid on sides below lateral line, less strongly

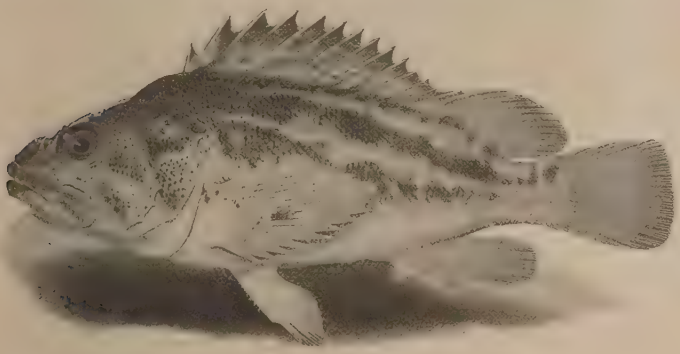


Fig. 5.—Sebastichthys trivittatus.

above; scales on head cycloid. Maxillary, mandible, and preorbital naked. Upper pectoral, dorsal, and caudal rays with very small scales nearly to their ends. Peritoneum white.

Color in spirits light gray with an irregular longitudinal dark brown or black bar above and below lateral line leaving lateral line in a light streak. Another dark bar along base of spinous dorsal. Dark bars radiating from eye across cheek. Each scale on head with a black spot. Fins dark.

In life bright yellow with slightly greenish cast everywhere, the blackish parts dark olive, the same yellow wash being over them.

Here described from a specimen from Hakodate. In length 36 cm.

This very beautiful species seems to be rare in Japan. Our specimens are from Aomori and Kushiro. It has no near ally among American species, *Sebastichthys vexillaris* being as near as any.

(*trivittatus*, three-striped.)

18. SEBASTICHTHYS OBLONGUS (Günther).

Sebastes oblongus GÜNTHER, Challenger Report Shore Fishes,[a] 1880, p. 64, pl. XXVIII; Inland Sea, Japan, Yokohama.—HILGENDORF, S. B. Gesell. naturf. Freunde, Berlin, 1880, p. 171, with plate; Tokyo.

Sebastodes oblongus JORDAN and EVERMANN, Fish. North and Middle Am., II, 1898, p. 1830; after Günther.

Head $3\frac{3}{5}$ in length; depth $3\frac{1}{2}$. D. XIII, 12; A. III, 5; scales 59 to 65. Scales rather irregular, much smaller above than below lateral line. Head scaly above as far forward as nostrils; very minute scales on preorbital. Snout pointed, longer than eye. Interorbital space flat, equal to eye, 6 in head. None of spines on upper side of head projecting, those on preopercle obtuse. Teeth in broad bands on jaws, vomer, and palatines. Maxillary reaching posterior margin of eye. Dorsal spines strong, fourth to seventh longest, $2\frac{1}{2}$ in head; anal spines stronger, much shorter than longest dorsal. Brownish, marbled with darker; lower parts and all fins with brown spots; an oblique brown streak from preorbital toward angle of preopercle.

Recorded from the Inland Sea of Japan and the market of Yokohama. Not seen by us. All our specimens of this type belong to *Sebastichthys mitsukurii* and it may be that *S. oblongus* is merely an extreme example of the same species.

This species was not taken by us. Were it not that Dr. Boulenger has verified for us Dr. Günther's count of scales, which agrees with that shown in his figure, we should believe that *Sebastichthys oblongus* is the same as *Sebastichthys mitsukurii*. Except for the larger scales of the latter, we know of no difference.

(*oblongus*, oblong.)

19. SEBASTICHTHYS MITSUKURII (Cramer).

Sebastes oblongus (var.?) STEINDACHNER and DÖDERLEIN, Denkschr. Akad. Wiss. Wien, 1884, p. 204; Tokyo.—NYSTROM, Kong. Vet. Ak., 1887, p. 20; Nagasaki.

Sebastodes mitsukurii CRAMER, in Jordan and Evermann, Fish. North and Middle Am., II, 1898, p. 1831; Tokyo, based on the description given by Steindachner and Döderlein.

Head $2\frac{1}{2}$ in length; depth 3. Eye 5 in head; snout $4\frac{2}{5}$; maxillary $2\frac{1}{10}$; interorbital $5\frac{1}{3}$. Dorsal XIII, 12 to 14 (usually 12); anal III, 7. Pores of lateral line 40 to 42.

Mouth large, maxillary reaching to behind eye. Jaws subequal or the lower very slightly projecting. Symphyseal knob scarcely developed. Teeth in broad bands on vomer and palatines. Teeth on front

[a] Dr. Boulenger has kindly reexamined the types of *Sebastodes oblongus*. He finds that they agree with Dr. Günther's plate in showing about 60 scales, counting oblique series below the lateral line. Scales 58, 59, 60, in 4 examples. In our specimens of *Sebastodes mitsukurii* a species otherwise very similar to *S. oblongus*, the scales counted in the same way, number from 42 to 46.

of mandible somewhat raised and fitting in a notch in maxillaries, not, however, developed in a knob. Eye small, a little shorter than snout. Interorbital flat sometimes slightly concaved usually unbroken by ridges, sometimes with slight nearly parallel ridges running backward from nasal spines. Cranial ridges all low, the occipital ridges best developed. Spines sharp but lying close to the skin and not prominent. Nasal, postocular, tympanic, and parietal spines present. Preorbital with slight rounded lobes, no spines present. Preopercle spines subequally spaced or the two upper sometimes closer together than others. Gill-rakers very short and blunt, one-fourth or one-fifth diameter of eye, 12 or 13 developed on anterior limb of arch.

Dorsal spines longer than soft rays, the fifth 2¾ in head; next to last equals snout; last 4 in head. Notch between dorsals rather deep. Pectoral rounded the lower 10 rays unbranched, its tip reaching slightly past ventrals to above vent. The second anal spine stronger and as long as third 3 in head; first spine half as long. Tips of last dorsal rays reach to base of auxiliary caudal rays, and slightly farther back than those of anal. Caudal rounded. Peritoneum white.

Scales ctenoid. Soft fins except ventrals with a few small scales at base. Preorbital scaled. Mandible and maxillary naked. Body clouded and spotted with dark brown, these spots forming 4 or 5 more or less conspicuous broken crossbars. Dark bars radiating from eye, especially conspicuous in small specimens. Rays of soft fins with dark spots which do not involve the membrane. All fins rather dark.

This species, which must be extremely close to *Sebastichthys oblongus*, we found abundant about the Inland Sea of Japan, and northward even to Hakodate. Our specimens are from Hakodate, Aomori, Matsushima, Tokyo, Yokohama, Onomichi, Kobe, and Nagasaki. It may be known from *Sebastichthys oblongus* by the presence of but 45 cross rows of scales instead of 55 to 65. It is perhaps not really a distinct species.

(Named for Kakichi Mitsukuri.)

20. SEBASTICHTHYS PACHYCEPHALUS (Schlegel).

MURA SOI (BLOTCHED ROCK-FISH).

Sebastes pachycephalus Schlegel, Fauna Japonica, Poiss., 1843, p. 47, pl. xx, fig. 3, Nagasaki.—? Richardson, Ichth., China, 1846, p. 214; Canton.—Günther, Cat. Fish., II, 1860, p. 97.—Steindachner, Reise Aurora, 1897, p. 202, Kobe.

Head 2⅓ in length; depth 2½; eye 4⅕ in head; maxillary 2⅕; snout 4⅕. Dorsal XIII, 13; anal III, 7; pores of lateral line, 30.

Body rather deep, deepest under first spine of dorsal. Mouth large, maxillary reaching nearly to below posterior orbital margin. Lower jaw included. Teeth in moderate bands, wide on front of premaxillaries, not developed in a knob at front of mandible. Narrowest part of interorbital space just behind preocular spine three-fifths eye.

Interorbital deeply concave, the median area between supraocular ridges flat and covered with small scales. Cranial ridges and spines well developed. Nasal, preocular, postocular, tympanic, and parietal spines present. Upper 2 preopercle spines the largest; all except the lower one, which is inclined downward, are directed backward. Gill-rakers one-fourth eye in length; 12 developed on anterior limb of arch.

Pectoral very broad and rounded, composed of 17 rays, the lower 10 very much swollen and unbranched; its tip reaches past tips of ventrals to above front of anal. Dorsal spines rather low, a little lower than soft rays, the fifth spine $2\frac{1}{2}$ in head, the last spine 3, next to last $3\frac{1}{2}$. Second anal spine a little longer and much stronger than third, twice as long as first. Caudal rounded.

Scales everywhere coarsely ctenoid. Preorbital, maxillary, and mandible naked. Small scales only on the base of soft fins. Peritoneum white.

Black or dark brown, with or without areas of gray. Usually a pale area under spinous dorsal, which in the fresh state is with golden-yellow reticulations and spots; a second light-yellowish area under front of soft dorsal. Fins and lower parts of body sometimes profusely covered with dark round spots. Spots on breast and base of pectorals sometimes round and distinct, sometimes diffused, sometimes running together, leaving this region dusky, or sometimes entirely absent, leaving this region cream color. Entire body sometimes uniform dark brown, lighter on breast and in front of pectoral, without markings of any kind.

This species is generally common in southern Japan, our specimens being from Wakanoura, Kobe, Hiroshima, and Shimonoseki. It is related to *Sebastodes chrysomelas* of the American coast.

Our various specimens, though differing much in coloration in the extremes, run together so that it is impossible to separate them. None of them differ in anything except coloration.

(*παχύς*, thick; *κεφαλή*, head.)

21. SEBASTICHTHYS ELEGANS (Steindachner and Döderlein).

Sebastes elegans STEINDACHNER and DÖDERLEIN, Fische Japans., III, 1884, p. 205; Tagawa, in the Inland Sea of Japan.

Sebastodes elegans JORDAN and EVERMANN, Fish. N. and M. A., II, 1898, p. 1830 (after Steindachner).

Head $2\frac{1}{2}$ in length; depth $2\frac{3}{4}$; eye $4\frac{1}{2}$ in head; snout $4\frac{2}{5}$; maxillary $2\frac{1}{4}$; interorbital width $6\frac{3}{4}$; dorsal XIII, 12, often XIV, 12; anal III, 7; pores of lateral line 30.

Mouth rather large, the maxillary reaching nearly to below posterior border of eye. Jaws equal. No knob at symphysis. Teeth in moderate bands. Interorbital deeply concave, the supraorbital edges raised. Near middle of interorbital are 2 curved longitudinal ridges,

between which runs a very narrow deep canal. Cranial ridges and spines well developed. Nasal, preocular, postocular, tympanic, and parietal spines present. Preorbital with 2 sharp angles, but without spines. Gill-rakers very short and blunt, 14 on anterior limb of arch.

Dorsal spines variable in number, 13 to 14, a character very unusual in this group, lower than dorsal rays, the longest 3 in the head; the next to the last 3¾; the last 3⅓. Notch between dorsals not very deep. Pectoral rounded, the lower 10 rays not branched, reaching past ventrals and slightly past vent. Ventrals reaching to vent. Second anal spine stronger and longer than third, 2½ in head; first spine one-half length of second. Tips of last anal rays scarcely reaching base of auxiliary caudal rays, not extending so far back as dorsal rays. Caudal rounded.

Scales weakly ctenoid. Few auxiliary scales present. Mandible

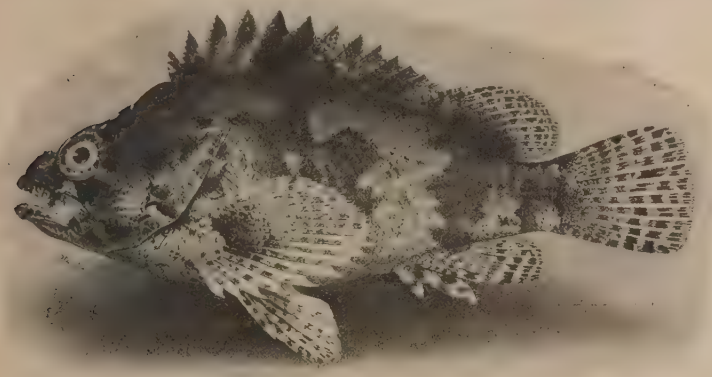


Fig. 6.—Sebastichthys elegans.

and preorbital naked. Maxillary with a few embedded scales near anterior end only (these not always evident, never evident without the aid of the lens, and after specimen has been out of alcohol a few minutes and has become slightly dry). Median rays of pectoral with fine scales nearly to their tips. Peritoneum white.

The following color description was taken from a fresh specimen: Gray much mottled with darker and with flesh color. Body with 4 diffuse dark cross bands, first at shoulder, second behind pectoral, third narrower; more distinct under soft dorsal; fourth at base of caudal. A black band covering top of head; extending on cheeks. A pale preorbital band from eye, and a pale band on preopercle behind eye. Lower jaw with dark spots. Large black spot at angle of mouth, another on maxillary. Belly mottled with black. Dorsal olive and a dusky shade corresponding with body bands; first 2 spines black. Tips of fins flesh color. Caudal flesh color at base, the termi-

nal half reddish, with broad dark base made of 3 or 4 bars. Anal spines scarlet, barred with black. Soft dorsal dusky at base with pale streaks, tipped with flesh color. Ventral colored like anal; first spine reddish, the thin flesh color at tip blackish, paler at base. Pectoral flesh color barred with blackish; lower rays tinged with orange. Pale shades on lower fins somewhat tinged with golden.

Here described from specimens from Misaki 15 to 17 cm. in length.

The species may be separated from *Sebastichthys pachycephalus* (which it somewhat resembles) at a glance by the narrow, deep channel along middle of interorbital. The area between raised supraorbital rims in *S. pachycephalus* is wide and scaled over.

This small and handsome species, like the preceding, has no homologue on the American coast. Our specimens are from rocky shores about Misaki, Onomichi, and Miyajima. About the famous sacred island of Miyajima it is especially abundant.

Table of dorsal spines.

Number of specimens.	Locality.	Number of dorsal spines.
2	Tokyo	14
24	Misaki	14
3	Kobe	14
4	Miyajima	14
8	....do	13
3	Onomichi	13

4. NEOSEBASTES Guichenot.

Neosebastes GUICHENOT, Mém. Soc. Nat. Sci., Cherbourg, XVI, 1868, p. 83 (*panda.*)

This genus is closely allied to *Sebastichthys*, having 13 dorsal spines, which are very long and strong; a series of strong spines in a line from edge of preorbital across suborbital stay and preopercle; a long band of palatine teeth; armature of upper parts of head much as in *Sebastichthys*; vertical fins, scaleless.

Indian seas.

In Guichenot's arrangement *Neosebastes* differs from *Sebastes* in having the vertical fins scaleless and the lower rays of the pectorals branched like the upper and not exserted. This latter character is not found in the Japanese species, *N. entaxis*, which may represent a distinct genus.

(νεός, new; Sebastes.)

22. NEOSEBASTES ENTAXIS Jordan and Starks, new species.

Head $2\frac{2}{5}$ in length; depth $2\frac{2}{5}$. Dorsal XIII, 9; anal III, 5 (or 6, counting the last very fine ray). Pores in lateral line 31. Eye $3\frac{1}{2}$ in head; interorbital $5\frac{1}{2}$; maxillary $2\frac{2}{3}$.

Body not greatly compressed, the back slightly elevated. Mouth not very oblique, the front of premaxillary well below level of lower

part of orbit. Maxillary extending to below middle of eye, lower jaw not projecting, a knob developed at symphysis. Teeth in a moderate band on lower jaw, in a broader band on premaxiliary, becoming very broad anteriorly. Tip of mandible fitting into a toothless notch in front of premaxillaries, but without a knob of teeth. Bands of teeth on vomer and palatines a little narrower than on mandible. Anterior nasal with a large backward-extending flap. Interorbital deeply concave, the supraorbital region on each side closely scaled and sloping inward and downward to a naked median channel, which runs to a point anteriorly. Eye elliptical, its long diameter considerably longer than snout. Nasal spines small and sharp. Preocular margin with a pair of small spines on each side. Supraocular margin with 5 or 6 small, very sharp spines, growing larger posteriorly. Parietals with

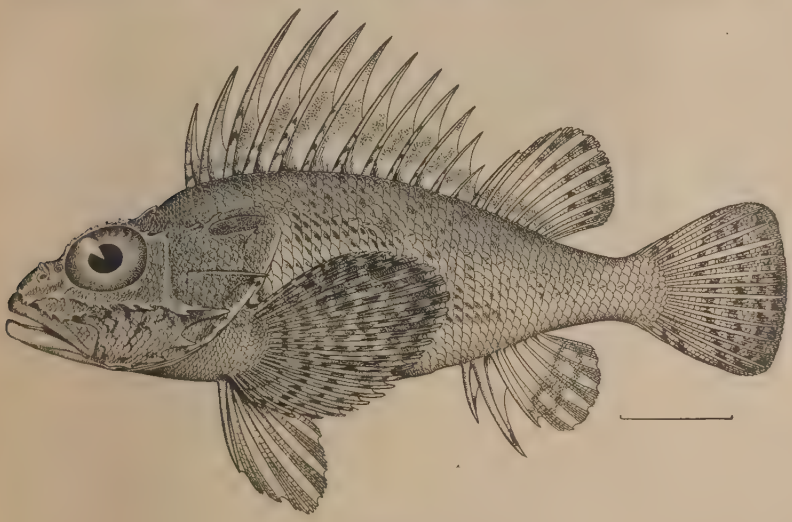


FIG. 7.—NEOSEBASTES ENTAXIS.

a pair of very sharp, widely diverged, naked ridges, ending in spines. A couples of spines are present behind the upper fourth of eye, and farther back, slightly above them, is a similar spine on post-temporal. Preorbital with a bunch of 2 or 3 spines on its anterior edge, pointing forward, and 3 sharp, hooked spines pointing backward along the rest of its lower edge. A row of sharp spines inclined backward from preorbital to preopercle, the first large one on center of preorbital preceded by 1 or 2 tiny ones; 2 or 3 under anterior half of eye, one recumbent upon another; a similar group under posterior part of eye, having an interval between; a very long, sharp spine on preopercle, its point nearly reaching edge of opercle, a secondary ridge and spine developed on its base. Edge of preopercle with 3 smaller spines below, growing smaller downward. Opercle with 2 spines; the upper

one moderate in size, inclined somewhat upward, not preceded by a ridge; the lower one is long and sharp, pointing straight backward and preceded by a sharp, naked ridge, which runs nearly across the whole length of opercle. Eight gill rakers developed on anterior limb of arch, the longest one-third the long diameter of eye.

Scales ctenoid, though not roughly. Lateral line anteriorly raised in a low ridge. Head with scales to tip of snout; preorbital, interorbital, suborbital regions and nape with fine, crowded, irregular scales; scales more regular and larger on cheek and opercle; interopercle and maxillary with scales; branchiostegal region and mandible naked; the latter with a great many pores scattered irregularly over it; opercle with a naked flap above; upper opercle spine. Fins naked.

Pectoral scarcely reaching front of anal (slightly past in cotype); it has 13 branched rays and 8 simple ones; the fourth or fifth ray from the uppermost the longest. Ventrals rather wide apart, not reaching to vent. Dorsal and anal spines each with a channel along its side, reaching its entire length. Third dorsal spine the longest, $3\frac{1}{3}$ in entire length without caudal; the first scarcely half as long, equal to the thirteenth; the twelfth three-fifths eye. Longest dorsal rays $2\frac{1}{3}$ in head. Second anal spine much stronger and longer than third, $2\frac{1}{3}$ in head; the first $1\frac{3}{4}$ in second. Caudal truncate. Peritoneum white. Color, light below, mottled with fine lines and spots on sides and back. Pectoral dark, the color solid above, with white spots below. Anal with white spots on a dusky ground. Soft dorsal and anal rays crossed with dark lines. Spinous dorsal mottled. This species is known to us from two fine specimens, the one from Chosu, in Shimosa, the other from Misaki. From the first the drawing is taken. The species is known locally as Kasago.

The type is from Misaki. It is 17 cm. in length and is numbered 7367. Ichthyological collections, Leland Stanford Junior University Museum. The cotype from Chosu is numbered 50906 in the United States National Museum.

(*ἐντάξις*, in array, from the rank of spines.)

5. THYSANICHTHYS Jordan and Starks.

Thysanichthys Jordan and Starks, new genus (*crossotus*).

This genus differs from *Sebastodes* chiefly in having dermal filaments on head and along lateral line; no enlarged spine on edge of preopercle or ridge on opercle. It has teeth on the palatines; 13 dorsal spines; well-developed spines on top of head, along suborbitals, and edge of preopercle.

Species of small size and bright colors.

(*θυσάνος*, a fringe; *ἰχθύς*, fish.)

23. THYSANICHTHYS CROSSOTUS Jordan and Starks, new species.

Head $2\frac{1}{3}$ in length without caudal; depth $2\frac{3}{5}$. Dorsal XIII, 11; anal III, 5. Pores of lateral line 23. Eye $3\frac{2}{5}$ in head; maxillary $2\frac{1}{2}$; interorbital $5\frac{1}{4}$.

Lower jaw not projecting. Symphysis with a knob. Maxillary reaching to below middle of eye. Anterior end of premaxillaries on a level with or slightly above lower margin of orbit. Teeth in rather broad bands on jaws; in narrower bands on palatines and vomer; teeth developed in a knob at tip of mandible, which fits in a toothless notch at front of premaxillaries. Interorbital deeply concave and covered with scales, and with a pair of interorbital ridges with a moderate channel between them. Cranial spines large and more erect than in

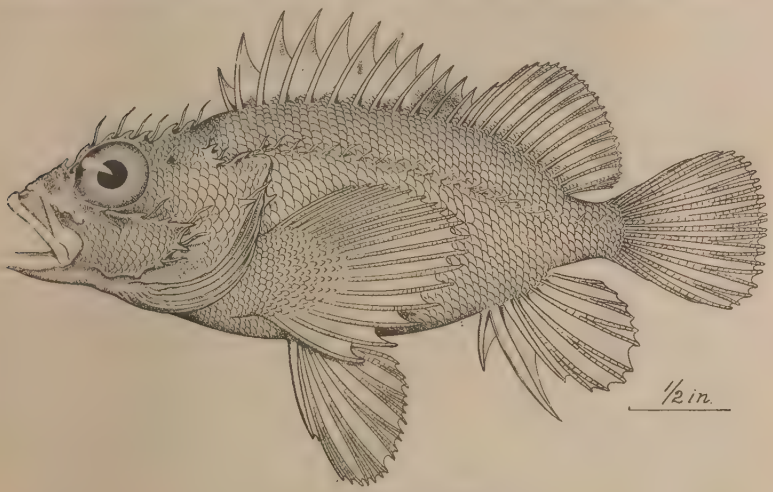


FIG. 8.—THYSANICHTHYS CROSSOTUS.

the genus *Sebastichthys*, not preceded by ridges even at occiput. Nasal, preocular, supraocular, postocular, tympanic, parietal, and nuchal spines present. Preorbital with 3 lobes, the anterior one broadly rounded, the others angulated, but without spines. A ridge of 3 low spines extends along suborbitals. Preopercle with 5 spines, the upper 3 sharp, the others blunt, the uppermost one hooked upward. Two hundred spines present, rather close together. Opercle with 2 spines of equal size, the upper one inclined slightly upward. Spines on top of head each with a long filament behind; the longest ones half eye in length. Similar filaments behind the preorbital lobes, the spines on suborbitals, the three upper spines on preopercle, and a fringe of them along lateral line. Gill rakers very short, about one-fourth diameter of pupil, 7 of them developed on anterior limb of arch.

Scales roughly ctenoid. Lateral line running in a crooked line.

Upper parts of head with scales to tip of snout. Maxillary and preorbital with scales. Suborbital and mandible naked, the latter with three large pores on its lower side. Base of pectoral caudal and soft dorsal with scales; other fins naked. Pectoral reaching to above base of third anal spine; it has 10 simple rays and 7 branched ones. Ventrals barely reaching to front of anal. Dorsal and anal spines each with a longitudinal channel, as in the genus *Neosebastes*. The anterior dorsal spines strongly curved. Third, fourth, and fifth dorsal spines of about equal length, $2\frac{1}{2}$ in head; the thirteenth higher than the twelfth by half the diameter of the pupil. Second anal spine much stronger and larger than third, nearly as long as soft rays, $1\frac{5}{6}$ in head; the third $2\frac{3}{4}$; the first $2\frac{1}{4}$ in the second. Peritoneum white.

Color in spirits: Body and fins with little color remaining. Indications of a dusky blotch under first dorsal spine, one under middle of spinous dorsal and one under last spine. A black spot on spinous dorsal from ninth to twelfth spine; fins otherwise colorless.

This species is known to us from a single example, 85 mm. long, dredged by the U. S. Fish Commission steamer *Albatross* at Station 3720, in Suruga Bay, off Ose Point, in 63 fathoms. It is numbered in the U. S. National Museum 50907.

(κροσσωτός, fringed.)

6. SEBASTISCUS Jordan and Starks, new genus.

Sebastiscus Jordan and Starks, new genus (*marmoratus*).

This genus is based on species having the external appearance of *Sebastodes* and much resemblance to the subgeneric group called *Pteropodus*, but having but 12 spines in the dorsal fin and the vertebræ 10+14=24, agreeing in these regards with *Scorpæna*. From *Helicolenus*, *Sebastiscus* differs, solely, perhaps, in the presence of a well-developed air bladder. Peritoneum pale. The two known species are very much alike and both very abundant in Japan.

(σεβαστίσκος, a diminutive form, from Sebastes.)

a. Color olivaceous, mottled with darker; no spine below eye; shore species. *marmoratus*, 24.

aa. Color rose red, marbled with golden and violet; a small spine close below lower margin of eye; species inhabiting deeper water ..... *albofasciatus*, 25.

24. SEBASTISCUS MARMORATUS (Cuvier and Valenciennes).

KASAGO.

Sebastes marmoratus Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 345; Japan, Coll. Langsdorf.—Schlegel, Fauna Japonica, 1843, p. 46, pl. xxi, fig. 1, 2; Nagasaki.—Günther, Cat. Fish, II, 1860, p. 104; Japan, China.—Steindachner, Fische Japans, III, 1884, p. 32; Tokyo.—Nystrom, Kong. Vet. Handl., 1887, p. 20; Nagasaki.—Ishikawa, Prel. Cat., 1897, p. 51; Fukushima, Tokyo, Kii.

Helicolenus marmoratus Jordan and Snyder, Check List, 1901, p. 98; Hakodate.

Sebastes crassispinis Döderlein, Fische Japans, III, 1884, p. 32; Tokyo.

? Sebastes sinensis McClelland, Calcutta Journ. Nat. Hist., IV, 1843, p. 397, pl. xxi, fig. 3; Chusan, China.

Head $2\frac{2}{5}$ in length without caudal; depth $2\frac{3}{8}$. Dorsal XII, 12; anal III, 5. Pores in lateral line 46. Eye $4\frac{1}{4}$ in head; maxillary $2\frac{1}{4}$; interorbital half orbit.

Jaws equal, or the lower slightly included. Symphyseal knob slight. Maxillary nearly reaching to below posterior margin of eye. Teeth in rather wide bands, very wide at front of premaxillaries, narrower on vomer and palatines; in a V-shaped band on vomer. Cranial spines high and sharp; nasal, preocular, superocular, postocular, tympanic, coronal, parietal, and nuchal spines present; coronal spines ending just anterior to a line between tips of tympanic spines. Occipital ridges high. A small dermal filament usually present behind each of the parietal, nuchal, and superocular spines. Interorbital deeply concave; the interobital ridges end behind in the coronal spines and have a deep channel between them, which is narrow between eyes and grows wider between coronal spines. Preorbital with a spine on its posterior lower edge and 2 very low lobes anteriorly. Preopercle spines moderately sharp, the upper 3 directed backward, the lower 2 downward and backward; the next to the upper the largest. Opercle with 2 flat spines, the upper one directed slightly upward. Gill-rakers short, in length about one-fourth eye, 13 to 15 on anterior limb of arch, counting 3 or 4 anterior tubercles.

Scales everywhere ctenoid, except on breast. Pectoral with scales extending about half the length of median rays; other fins except ventrals with fine scales at the base. Maxillary, preorbital, mandible, and branchiostegals naked; subopercle naked except at its posterior end.

Pectoral with 18 rays, an equal number simple and branched, the former projecting beyond the others; the upper posterior edge of the fin usually concave, sometimes obliquely truncate; pectoral reaching past tips of ventrals, usually but slightly, sometimes nearly to front of anal. Fourth dorsal spine 3 in head; the eleventh $3\frac{3}{4}$; the twelfth $4\frac{1}{2}$. Dorsal spines a little lower than the soft rays. Anal spines all stout, the second stronger and a little longer than third, which is $2\frac{1}{3}$ in head and twice as long as first spine; the spines considerably shorter than the soft rays. Caudal truncate, or very slightly rounded. Peritoneum white.

Color in spirits: Dark brown on back, belly white or light brown; 5 light spots along back at base of dorsals, one below fourth and fifth spines, one below seventh and eighth, one below last spines and first rays, one below middle rays, and one on caudal peduncle behind last ray; the dark-brown area between the spots with its edges usually darker and sometimes extending up on the dorsal; below, marbled with brown; soft fins brown, and with white spots, giving fins the appearance of having crossbars of white and brown; fins in some specimens nearly colorless. Other specimens have ocellated light spots scattered over the sides.

The following color note was taken from a specimen in a fresh state: Head and body above brassy, changing to light carmine below; spots on body light olive green (bluish in life); spots at base of dorsal reddish yellow; fins all suffused with carmine; spots on dorsal and anal same as on body; caudal spots whitish.

This species is one of the most abundant of the shore fishes of Japan, and varies widely in color, according to depth and condition. The whitish spots along the base of the dorsal and the dark dots or bars on the pectoral are very constant.

Sebastiscus albofasciatus, closely resembles it, but may be known by the bright red coloration and the presence of the small spine below the eye, which is wanting in *Sebasticus marmoratus*.

This species is known everywhere as Kasago. Our specimens are from Hakodate, Same, Tokyo, Misaki, Sagami Bay, Enoshima, Suruga Bay, Kobe, Hiroshima, Wakanoura, and Nagasaki It was dredged by the U. S. Fish Commission steamer *Albatross* in Suruga Bay, at station 3718, off Ose Point, in 65 fathoms.

(*marmoratus*, marbled.)

25. SEBASTISCUS ALBOFASCIATUS (Lacépède).

AKAKASAGO (RED ROCK-FISH).

Holocentrus albofasciatus LACÉPÈDE, Hist. Nat. Poiss., IV, 1802, p. 372; Japan; from a specimen in Mus. Berlin; coll. Langdorf.

Sebastes albofasciatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, p. 344; after same specimen.

Head $2\frac{1}{2}$ in length without caudal; depth 3. Dorsal XII, 12; anal III, 5. Pores in lateral line, 48. Eye $3\frac{1}{3}$ in head; interorbital width 7; maxillary $2\frac{1}{3}$.

This species differs but little from *Sebastiscus marmoratus*. The cranial spines are usually sharper, and the ridges a little more acute; at the lower rim of the orbit on the upper edge of the suborbital stay, is a sharp spine, directed backward and slightly upward, which is entirely absent in *S. marmoratus;* the eye is larger and the upper simple rays of the pectoral slightly more produced, their tips always extending well past tips of ventrals.

The alcoholic specimens are more nearly colorless; they have a few dusky spots on upper pectoral rays, and the brown color on back between light spots, extends slightly on dorsals; fins otherwise colorless; the slight spots on back instead of being yellowish, like an alcoholic fish without pigment, as in *S. marmoratus*, are with dead white pigment.

The following colors are shown by fresh specimens:

Bright scarlet with dark olive shades on back; the pale blotches on sides of back violet or lilac; membrane of ventrals, anal and caudal lobes above and below bright lilac violet; fins otherwise orange; the membrane of the dorsal tipped with violet; pectorals pale, with dark olive dots, toward the tip.

This specimen is from station 3715, off Ose Point, Suruga Bay, 68 to 65 fathoms.

Body and head above vermilion red with reticulations of bright lemon yellow. Below whitish, clouded with red. Soft dorsal, caudal and anal with yellow; pectoral with some dark spots toward the tip, the fin shaded with bright violet. This specimen is from Nagasaki.

This species lives in deeper water than *Sebastiscus marmoratus*, and is almost equally common, though not nearly so often seen in the markets. Through the kindness of Dr. Hilgendorf we have received a description of Lacépède's original type, which is evidently identical with this species. Our specimens are from Tokyo, Misaki, Awa, Wakanoura, Nagasaki, and from the following dredging stations of the U. S. Fish Commission steamer *Albatross:* 3707, Ose Point, Suruga Bay, 63 to 75 fathoms; 3714, same locality, 48 to 60 fathoms; 3715, same locality, 68 to 65 fathoms; 3720, same locality, 63 fathoms; 3730, Owai Point, Totomi Bay, 34 fathoms; 3734, same locality, 48 to 36 fathoms.

This species can be almost always known at sight by the blackish dots or bars on the pectoral, wanting in all species of *Helicolenus*, and by the little spine under the eye, wanting in *S. marmoratus*. Like *Sebastiscus marmoratus*, and unlike the species of *Helicolenus*, it possesses a large air bladder.

(*albus*, white; *fasciatus* banded, but the markings are pink and golden.)

7. HELICOLENUS Goode and Bean.

Helicolenus Goode and Bean, Oceanic Ichth., 1896, p. 248 (*dactylopterus*).

Body oblong, somewhat compressed; head large, ctenoid scales on its tip, and on cheeks and opercles; several series of spinous ridges on head, but no occipital pit; mouth large with bands of villiform teeth on jaws, vomer, and palatines. Dorsal fin continuous, not deeply notched, with stout spines and 10 to 12 rays; anal with 3 spines and 6 rays; pectoral broad, fan-shaped, with rays arranged in three groups, the first of 2 simple rays, the second of 8 or 9 branched rays, the third of 8 simple rays, sometimes prolonged, with their tips more or less free from membrane; soft dorsal with tips free from membrane; suborbital keel smooth, or nearly so; preorbital with spines small and hidden beneath the skin. Vertebræ 10 + 14 = 24; no air bladder. Peritoneum black. Atlantic. Very close to *Scorpæna*, differing only in the *Sebastes*-like cranium. From *Sebastichthys* it is distinguished by the smaller number of vertebræ, by the presence of but 12 dorsal spines, as also by the entire absence of the air bladder.

(ἥλικος, strong; ὠλένη, elbow, arm.)

a. Posterior edge of eye without spine; mouth black; body with 3 wide diffuse green or red bands ..... *dactylopterus*, 26.

aa. Posterior edge of eye with a spine; two spines under the eye ..... *cubanicus*, 27.

26. HELICOLENUS DACTYLOPTERUS (De La Roche).

Scorpæna dactyloptera De La Roche, Ann. Mus., XIII, 1809, pl. XXII, fig. 2; Ivica, Barcelona.—Risso, Ichthyol. de Nice, 1810, p. 186.—Günther, Challenger Report, I, 1880, Pt. 6, p. 6.—Jordan and Gilbert, Synopsis, 1883, p. 679.

Sebastes dactylopterus Günther, Cat., III, 1860, p. 99.

Sebastopolus dactylopterus, Goode and Bean, Bull. Mus. Comp. Zool., X, 1883, No. 5, p. 214.

Helicolenus dactylopterus Goode and Bean, Oceanic Ichthyology, 1896, p. 249, pl. LXVIII, fig. 244.

Sebastes imperialis Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 336; Nice.

Sebastes hilgendorfi Döderlein, Fische Japans, IV, 1884, p. 34; Tokyo.

Head $2\frac{1}{2}$ to $2\frac{4}{5}$ in length without caudal; depth $2\frac{3}{4}$ to 3. Dorsal XII, 12; anal, III, 5. Pores of lateral line 26; oblique series of scales below lateral line running downward and backward, 41. Eye $2\frac{4}{5}$ to $3\frac{1}{5}$ in head; maxillary 2 to $2\frac{1}{5}$; interorbital width, 8.

Mouth large, the maxillary nearly or quite reaching to below posterior margin of eye. Lower jaw but slightly projecting; symphyseal knob small and sharp; tip of lower jaw fits in a vostral notch. Bands of teeth of moderate width, rather wide at tip of premaxillaries. Interorbital space very narrow and deeply concave, not narrowest just behind preoculars, but nearly parallel for nearly half its anterior length. A pair of ridges running very close to edge of superorbital edge, between them a wide, deep channel. Cranial spines small and sharp, scarcely elevated; nasal, preocular, superocular, postocular, tympanic, parietal, and nuchal spines present; supraocular, postocular, and tympanic in line with each other and with supraorbital ridge. Suborbital ridge rather narrow and sharp, and with scarcely perceptible spines. Preopercle spines divergent, the next to the upper one the largest. Preorbital with 2 or 3 very low lobes, but without angles or spines. Gill-rakers small, 16 on anterior limb of arch, the longest three-fourths of interorbital width.

Scales weakly ctenoid; maxillary, mandible, preorbital, and interopercle naked.

Fourth dorsal spine $2\frac{3}{5}$ to $2\frac{4}{5}$ in head; the twelfth, 4; the eleventh, 5. Second anal spine stronger, but of equal length to third; in the declined fin, the latter projects slightly beyond the second; the second 3 to $3\frac{1}{6}$ in head; the first one-third of second; the anal rays one-third or one-fourth of second spine longer than spines. Pectoral reaches just past tips of ventrals; the first 2 upper rays simple, the next 9 branched, and the lower 8 simple, the longest ones projecting slightly beyond the branched rays; the posterior outline of the branched rays, when fin is spread, obliquely truncated. Peritoneum black.

A few dusky markings on back usually outlining light spots just below base of dorsals, placed as in species of *Sebastiscus;* a dark

shade sometimes present on opercle, caused by dusky lining, showing through. No other color on alcoholic specimens. The following color was taken from a fresh specimen: Bright crimson with vague paler shades on back and red shades from eye. Pectoral blood red; other fins red, but paler.

Here described from specimens from 16 to 22 cm. in length from Misaki.

It is with much doubt that we identify this species with the Mediterranean form, but having no specimens from the Atlantic side, and being unable to find sufficient characters in current descriptions, we can not do otherwise.

It is common in the deeper waters off Misaki and Awa. We have many specimens from Misaki, Tokyo market, Sagami Bay, Suruga Bay, these last dredged by the U. S. Fish Commission steamer *Albatross*. The stations are: 3698, Manazuru Point, Sagami Bay, 501 to 749 fathoms; 3717, Ose Point, Suruga Bay, 68 to 65 fathoms, and 3719, same locality, 90 to 70 fathoms.

(δάκτυλος, finger; πτερόν, fin.)

27. HELICOLENUS EMBLEMARIUS Jordan and Starks, new species.

Head 2⅔ in length without caudal; depth, 2½. Dorsal XII, 12 or 13; anal III, 7 counting last slender one. Pores of lateral line, 28; oblique series of scales below lateral line, 40. Eye, 2⅔ to 3 in head; least interorbital width, 7; maxillary, 2⅛.

Tip of mandible not projecting; symphyseal knob but little developed. Mouth moderate, the maxillary scarcely reaching to below posterior edge of pupil. Teeth in rather narrow bands on jaws, very narrow on palatines and vomer; front of premaxillaries with scarcely a notch, the bands of teeth of each side nearly touching; palatine bands toward anterior ends turned rather sharply inward to vomer. Cranial spines strong and erect. Nasal, preocular, supraocular, postocular, tympanic, coronal, parietal, and nuchal spines present; coronal spines rather small, blunt in the largest specimens; all of the spines growing blunter and less erect with age; in the larger specimens a spine or tubercle of bone developed laterally on supraorbital margin between pre and super ocular spines. Suborbital margin a sharp ridge, broken up into 2 sharp, backward directed spines. Posterior, upper margin of orbit with a blunt tubercle developed, sometimes paired on one or both sides. Preopercle with 5 spines, the second and third from the lowest the largest, the lowest hooked forward. Opercle with 2 flat spines not preceded by ridges. Preorbital with an anterior, very low, rounded lobe, behind it a large double spine, and at the posterior end either a similar one, or a single spine, sometimes double on one side and single on the other of the same specimen. Interobital concave; narrowest just behind preocular spines; growing rapidly wider pos-

teriorly, the sides nowhere parallel; a pair of interocular ridges with a moderately wide channel between them. Gill-rakers, 17; the longest $4\frac{1}{2}$ in postocular part of head.

Pectoral reaching to front of anal or slightly past; lower 9 rays simple, the other 9 rays branched, except the upper 1 or 2, which are simple. Ventrals not reaching anal. Third dorsal spine $2\frac{3}{8}$ in head; fourth $2\frac{1}{7}$; last $3\frac{3}{4}$; next to last 5; spines much longer than rays. Longest anal spines but little shorter than soft rays; the second much stronger and as long, or sometimes longer, than third; second spine $2\frac{1}{4}$ in head; first spine half as long. Caudal slightly rounded. Peritoneum black. Color in life bright red, with broad cross-bands of deep crimson extending on the fins, the color almost exactly that of the "Spanish

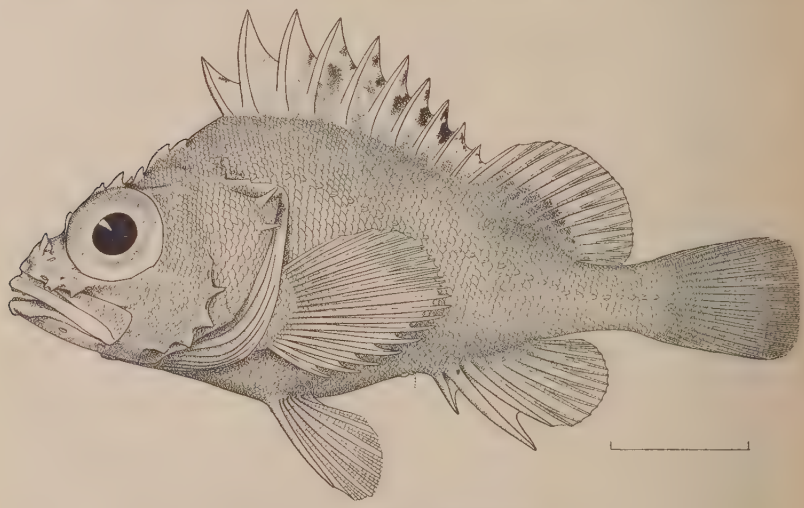


FIG. 9.—HELICOLENUS EMBLEMARIUS.

flag," *Sebastichthys rubrivinctus* of the California coast. Alcoholic specimens colorless, except sometimes margin of membrane between dorsal spines is dusky.

This species may be at once known from *Helicolenus dactylopterus* by the large erect cranial spines; the spines on orbital rim below and behind; the large preorbital spines; the presence of coronal spines; the wider interorbital space, which is narrowest just behind preocular spines and grows rapidly wider behind; and by the anal spines being but little shorter than the soft rays.

Unfortunately, the specimen here figured has but 11 dorsal spines, the first being obsolete, the first developed spine higher than usual, and the blunt spine at upper posterior orbital margin is not developed.

The type 18 cm. long from Okinose near Misaki. It is numbered

7364, Ichthyological collections, Leland Stanford Junior University Museum. Cotypes bear the number 50908, U. S. National Museum.

Several other specimens, all with 12 dorsal spines, were taken for us by Kumakichi Aoki off Misaki with long lines. The largest specimen is 25 cm. in length.

(*ἐμβλέμα*, flag.)

8. SCORPÆNA (Artedi) Linnæus.

Scorpæna Artedi, Genera, 17, XX, 1738, p. 47.

Scorpæna Linnæus, Syst. Nat., 10th ed., 1758, p. 266, (*porcus*) (breast almost naked).

Parascorpæna Bleeker, Versl. Ak. Amst., (2), IX, 1876, Pt. 3, p. 296 (*picta*) (species with the breast scaly).

Body oblong, somewhat compressed. Head large, not much compressed, naked above, and more or less uneven with spinous ridges, often with dermal flaps. Mouth large, with bands of villiform teeth on jaws, vomer, and palatines. Scales mostly ctenoid, of moderate size, often with skinny flaps. Dorsal fin with 12 stout spines; anal with 3 spines, the second commonly the longest; pectorals large, rounded, the base usually procurrent; some or all of the upper rays divided, the lower simple; ventrals inserted behind pectorals. No air bladder. Vertebræ 10 + 14 = 24. Species numerous in the tropical seas; fishes of singular forms and bright colors; the variation in squamation and armature very great, but, as in most similar cases, it is not easy to find definite characters for subdivision.

(*σκόρπαινα*, the ancient (generic) name of *Scorpæna scrofa*, from *σκορπίος*, scorpion, in allusion to the dorsal spines, which inflict a very painful, sting-like wound.)

a. Interorbital space relatively narrow and deeply concave; no flap on inner base of pectoral.

b. Head about 2⅔ in length.

c. Maxillary reaching a little past posterior edge of pupil. Scales 40 ..... *fimbriata*, 28.

cc. Maxillary not reaching as far as middle of eye. Scales 45 ..... *miostoma*, 29.

bb. Head about 2½ in length; maxillary reaching nearly to posterior margin of eye ..... *onaria*, 30.

aa. Interorbital space wide and shallow; a flat flap on inner base of pectoral. Scales 41 ..... *izensis*, 31.

28. SCORPÆNA FIMBRIATA Döderlein.

Scorpæna fimbriata Steindachner and Döderlein, Fische Japans, III, 1884, p. 195; off Tokyo.

Head 2⅔ in length without caudal; depth 2½. Dorsal XII, 10; anal III, 6. Pores in lateral line 22; scales 40, counting subvertical series above lateral line. Eye 4 in head; maxillary 2⅔; interorbital space 7.

Head rather short. Mouth moderate, the maxillary reaching but little past posterior edge of pupil. Jaws equal. Knob at symphysis moderate. Teeth in narrow bands on jaws, narrower on palatines and

vomer. Cranial spines sharp, nasal, preocular, supraocular, postocular, coronal, parietal, and nuchal spines present; the coronal spines at the end of the low interorbital ridges, just behind the eye on a level with upper edge of pupil, are a pair of spines set close together, and a sharp ridge ending in a spine behind them. A pair of supraocular spines set close together; a backward hooked spine at center of preorbital in a line with suborbital ridge; suborbital ridge with 3 spines and a double preopercle spine in the same series; preopercle with 4 short, blunt spines below double spine at angle; opercle with 2 spines at the ends of ridges, diverging from a point near its anterior part, the lower ridge the larger; preorbital with a sharp spine pointing forward at its anterior end, a pair of spines pointing downward and forward near the middle lower edge, and the largest spine pointing backward and downward near its posterior edge. Pit at occiput evident, but not large. Interorbital narrow and deeply concave, the interorbital ridges close together and with a narrow channel between. A large tentacle behind supraocular spine on superorbital ridge; one on posterior margin of anterior nasal, one large one on preorbital behind last spine, extending over maxillary, and several smaller ones anteriorly; several on cheek below suborbital ridge; and several scattered over body. Gill-rakers very short and blunt, about 6 developed, and 3 or 4 rudimentary scales. Fins naked. Peritoneum white. Fourth dorsal spine $2\frac{1}{2}$ in head; the eleventh 5; the twelfth $3\frac{1}{2}$. Pectorals usually not reaching past ventrals, which just cover vent; 9 lower pectoral rays simple; 8 upper rays branched. Second anal spine stronger and longer than third, its length $2\frac{3}{5}$ in head.

Color, dark brown, irregular markings on back, surrounding lighter areas; the markings usually with sharp, cut edges, though sometimes shading into each other; markings continued on dorsal fins; a light area on base of spinous behind third dorsal spine, running down on back; a similar, more diffused area behind base of sixth or seventh spine; a light area under last spines and first soft rays; the surrounding dark area running up on middle rays of soft dorsal, and continued downward, forming an irregular crossbar; an irregular brown crossbar at base of caudal; brown bars radiating from eye more or less distinct; upper lip with or without brown markings; axil light dusky, mottled with white spots, which are variable in size, number, and position on different individuals; sometimes axil is faded and colorless. Young examples with fine brown and white mottling, which in the adult are faded and indistinct; a distinct wide crossbar of brown across caudal rays and sometimes a dark, conspicuous dark spot toward tips of posterior dorsal spines.

The following color note was taken from a fresh specimen: Olive above, much mottled; lower marks and bands bright red, those above rather brown.

This species may be known from *Scorpæna onaria*, which it most resembles, by the shorter head, smaller eye, smaller mouth, and lower cranial spines. In *S. fimbriata* the opercular flap is distant from the outline of back above it one diameter of eye; in *S. onaria* it is distant half the diameter of eye.

This species is known to us from several specimens taken at Wakanoura, Kobe, and Misaki, or found in the Tokyo market.

(*fimbriatus*, fringed.)

29. SCORPÆNA MIOSTOMA Günther.

Scorpæna miostoma GÜNTHER, Shore fishes of the Challenger, 1880, p. 65; Yokohama.

Dorsal XII, 10; anal III, 5. Lateral line 45. Palatine teeth; the vomerine teeth form a simple open V-shaped band. The height of the body is less than the length of the head, which is contained twice and one-third in the total length (without caudal). Head nearly entirely scaleless. Upper jaw slightly overlapping the lower. Orbital tentacles broad, fringed, shorter than the eye, which equals the length of the snout. Interorbital space deeply concave, with a pair of slight ridges within its concavity. Vertex with a quadrate depression, which is rather broader than long, and surrounded by spines. The maxillary does not extend backward to below the middle of the eye. All the cutaneous appendages on the head, body, and fins are well developed. The fourth and fifth dorsal spines are longest, two-fifths of the length of the head, and equal to the second of the anal fin, which, however, is stronger. Eight of the pectoral rays are branched. Body and fins marbled with the usual colors of this genus, but without any peculiar markings. The axil of the pectoral is scarcely spotted, and the lower part of the head is white. Length of specimen, 5¼ inches. Market of Yokohama (Günther).

This species is not represented in our collection. According to the description given by Günther, it may be known from the other Japanese species of *Scorpæna* by the maxillary not reaching to below the middle of the eye.

(*μεῖος*, reduced; *στόμα* mouth.)

30. SCORPÆNA ONARIA Jordan and Snyder.

ONARI (TABU).

Scorpæna neglecta, SCHLEGEL, Fauna Japonica, Poiss., 1848, p. 43, pl. LXXVII, fig. 4; Nagasaki (not *Scorpæna neglecta* of Heckel, 1840).

Scorpæna fimbriata NYSTRÖM, Kong. Vet. Handl., 1887, p. 18; Nagasaki (not of Steindachner).

Scorpæna onaria JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 365; with plate; Tokyo.

Of this species a good figure and description have been already given in these Proceedings.[a]

This species is occasionally taken on the coast of Japan. It is known to us only by the types of *Scorpæna onaria* which were taken by Professor Otaki in the market of Tokyo.

(*onari*, an Emperor's journey; a fish tabu, or set aside, for the Emperor.)

31. SCORPÆNA IZENSIS Jordan and Starks, new species.

Head $2\frac{1}{5}$ to $2\frac{1}{3}$ in length without caudal; depth $2\frac{5}{6}$ to $3\frac{1}{6}$. Dorsal XII, 10; anal III, 6. Pores of lateral line 23; suborbital series of scales above lateral line, 41. Eye $4\frac{1}{4}$ to $4\frac{1}{2}$ in head; maxillary $2\frac{1}{10}$; interorbital 6 to $6\frac{1}{2}$.

Lower jaw usually slightly projecting (scarcely projecting in type). Symphyseal knob large. Mouth large, the maxillary scarcely reaching to below posterior rim of orbit. Teeth rather coarse, in moderate bands on mandible and sides of premaxillaries, becoming very wide on front of the latter, in very narrow bands on vomer and palatines. Interorbital space wide and concave; as compared with its width much more shallow than *S. fimbriata* and *S. onaria*. The interorbital ridges are rather high and have a channel between them. Cranial spines high, but not very sharp. Nasal, preocular, superocular, postocular, coronal, parietal, and nuchal spines present; behind upper posterior margin of eye is a small bunch of 2 or 3 small spines, and behind it are 2 low spines preceded by ridges; suborbital ridge with the spines not set directly in line, terminating in a double spine at edge of preopercle, below which are 4 small preopercle spines, the upper 2 sharp, the lower 2 blunt; no spine at center of preorbital; 2 opercle spines at the ends of diverging ridges, the lower ridge many times the

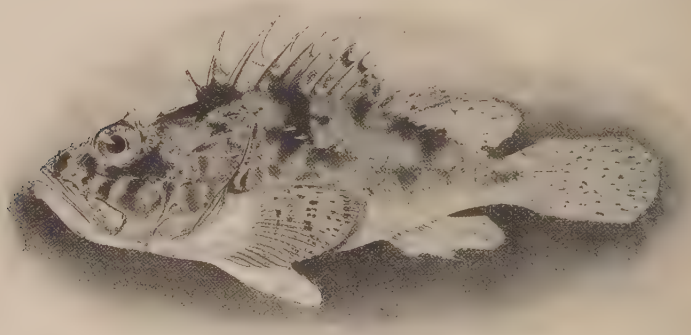


FIG. 10.—SCORPÆNA IZENSIS.

[a] Proc. U. S. Nat. Mus., XXIII, 1900, p. 365.

stronger; preorbital with a large spine at its lower posterior edge, a pair of smaller spines near the middle of its lower edge and an anterior rounded lobe. A tentacle behind each of the ocular spines, that behind superocular much the largest, and multifid; a small one behind the parietal and nuchal spines; a multifid one on posterior margin of anterior nostril; a few flat tentacles on soft part of eye above iris; one behind each suborbital spine; a large, flat, thin flap behind posterior preorbital spine, extending over maxillary, and similar ones along lower edge of preopercle; a long, simple tentacle at anterior end of preorbital, extending down to a level with teeth, a large flat flap on inner base of pectoral just behind upper rays, a series of thin flat ones along lateral line and similar ones variously scattered over the body. Gill rakers very short and blunt, 6 or 7 developed on anterior limb or arch, 3 or 4 rudimentary ones in front of them. Peritoneum white.

Pectorals extending a little past ventrals, which usually do not reach to vent; 10 pectoral rays branched, 9 simple. Third dorsal spine $2\frac{1}{5}$ in head, the first half as long; the eleventh $5\frac{1}{3}$; the twelfth $3\frac{1}{5}$. Second anal spine a little stronger and slightly longer than first (?), its length $3\frac{1}{10}$ in head. Caudal slightly rounded.

Color in spirits greyish, with large irregular blotches of brownish slate color on back and sides, with light areas between; a dark blotch above opercle flap involving base of front of dorsal back to third spine; a similar one on base of middle dorsal spines, running obliquely backward and downward, but very much broken up and irregular; a dark patch on posterior dorsal spines, and another under middle of soft dorsal; the light areas between running out on spines and rays of dorsal to their tips; a dark band across snout and another between eyes, leaving a light band between; dark spots on pectoral rays, forming irregular cross lines; soft dorsal, anal and caudal with scattered small black spots; ventrals colorless. Axil colorless, or with diffused black spots variable in number and position.

The color of a specimen from Suruga Bay when first examined was as follows: Deep maroon purple, variegated with olive above and shaded with pinkish, below pinkish with golden shades; flaps flesh color, sides and top of head maroon purple, cheeks golden below; lower jaw and belly white. Dorsal pale with crimson edge and a few dusky mottlings, the soft dorsal pale, reddish edged, axil plain yellowish. Pectoral pale, centrally flesh color, spotted with round dots of maroon crimson. Caudal pale, violet at tip.

This species may be distinguished from *Scorpæna onaria* and *S. fimbriata* by the wide interorbital space and by the flap on inner part of pectoral base. Of this species we have several large specimens dredged by the U. S. Fish Commission steamer *Albatross* in Suruga Bay, and smaller ones in Sagami Bay and Totomi Bay. The localities are: 3708, Ose Point, Suruga Bay, 60 to 70 fathoms; 3713, same local-

ity, 45 to 48 fathoms; 3715, same locality, 68 to 65 fathoms; 3717, same locality, 63 to 100 fathoms; 3720, same locality, 63 fathoms; 3729, Omai Point, Totomi, 34 fathoms; 3754, Sune Point, Sagami Bay, 48 to 52 fathoms; 3755, same locality, 57 to 77 fathoms; 3763, same locality, 49 to 52 fathoms; 3765, same locality, 68 to 45 fathoms.

The type is the largest specimen, 245 mm. in length; it is numbered 50909 in the U. S. National Museum. Cotypes are No. 7366, Leland Stanford Junior Ichthyological Collection.

(Izu, a province of Japan, occupying the promontory between Sagami and Suruga bays.)

9. SCORPÆNOPSIS Heckel.

Scorpænopsis Heckel, Ann. Wien. Mus., II, 1840, p. 159.
Scorpænodes Bleeker, Ind. Ned. Pisc., IV, about 1860, p. 452 (*diabolus*).
Scorpænichthys Bleeker, Bijdr. Ichth. Boero, Nat. Tijds. Ned. Ind., XI, about 1862, p. 402 (*cirrhosus*, not of Girard).

This genus differs from *Scorpæna* in the absence of palatine teeth. The species are of still larger size and more peculiar appearance.

(*σκορπαίνα*, Scorpæna; *ὄψις*, appearance.)

a. Pectorals never reaching much beyond tips of ventrals, never to anal; cranial spines entire; coloration greatly varied ..... *cirrhosa*, 32.
aa. Pectorals very long, reaching second anal spine; cranial spines much broken up with serrations; coloration less elaborately varied ..... *kagoshimana*, 33.

32. SCORPÆNOPSIS CIRRHOSA (Thunberg).

ONIKASAGO; ROKUBU (PILGRIM).

Perca cirrhosa Thunberg, Nya Handl., Stockholm, XIV, 1793, p. 199, pl. VII, fig. 2; near Nagasaki.
Scorpæna cirrhosa Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 318; Japan, Coll. Langsdorff; Malabar.—Schlegel, Fauna Japonica, Poiss., 1843, p. 42, pl. XVII, figs. 2, 3; Nagasaki.—Bleeker, Nieuwe Nalez., Japan, about 1863, p. 79.—Günther, Cat. Fish, II, 1860, p. 120; China, Japan, Raoul Island, Amboina.—Ishikawa, Prel. Cat., 1897, p. 50; Boshu.
Scorpænopsis cirrhosus Bleeker, Bydr. Ichth. Boero, Nat. Ned. Ind., XI, p. 402; Buru; Scorpænoides, 1876, p. 32; Singapore, Ternate, Buru, Amboina.
? *Scorpæna leonina* Richardson, Ichth. China, 1846, p. 216; Canton.

Head $2\frac{2}{5}$ in length without caudal; depth 3. Dorsal XII, 10; anal III, 6. Pores of lateral line 23. Eye 6 in head, $1\frac{2}{3}$ in snout; maxillary $2\frac{1}{5}$ in head; interorbital width $1\frac{1}{3}$ in orbit.

Lower jaw projecting; no knob at symphysis. Mouth large; the maxillary reaching to below posterior margin of orbit. Teeth rather coarse; set in very wide bands. Interorbital rather deeply concave; the interorbital ridges high and sharp; not ending in spines behind; a deep channel between them, divided anteriorly by a median ridge running back from premaxillary process. Premaxillary processes very high, forming a deep notch in profile between them and raised superorbital crests. Cranial spines large; nasal, preocular, superocu-

lar, postocular, tympanic, parietal, and nuchal spines present. A small double spine just behind upper posterior margin of eye; a ridge ending in a spine just behind it and above opercle ridge; a similar one behind it; and a third in the same series at beginning of lateral line, followed by much smaller plates on anterior end of lateral line. Opercle with two spines at the ends of diverging ridges, the lower ridge much the larger. Suborbital ridge of spines starts with a small spine at upper part of preorbital and ends with a double spine at preopercle, below which are two small preopercle spines. Preorbital with an anterior rounded lobe, a blunt spine just behind it directed forward, and a similar one at posterior end pointing backward. Gill-rakers very short, 11 of them on anterior limb of arch, counting three or four rudimentary ones.

Pectorals ending above tips of ventrals or reaching slightly past them, never reaching nearly to above front of anal. Spinous dorsal much lower than soft dorsal; the fourth ray 3 in head, the eleventh 6⅓, the twelfth 4. Second anal spine slightly longer, or sometimes of equal length, with the more slender third spine; its length 3½ in head. Caudal rounded.

Color in spirits, no uniform color pattern, backward sides everywhere marbled with dark brown or blackish; belly and lower parts white; the dark irregular markings on fins darker at the edges, making sharp contrast with the lighter markings; a light area on middle of upper part of pectoral; pectoral lighter around posterior edge; a lighter band across middle of caudal rays; radiating lines sometimes present around eye; axil variously marked, colorless or dusky.

This species is generally common in rocky places in southern Japan. We have specimens from 8 to 11 inches long from Wakanoura and Nagasaki. It is recorded from Honolulu and from various localities in the East Indies and Polynesia, but some references may belong to other species.

(*cirrhosus*, fringed with locks of hair.)

33. SCORPÆNOPSIS KAGOSHIMANA (Steindachner and Döderlein).

Scorpæna kagoshimana Steindachner and Döderlein, Fische Japans, III, 1884, p. 28; and in Fische Japans, IV, 1887, pl. III; Kagoshima.

Head 3 times in total length; depth 3⅓; Dorsal XII, 10; anal III, 5. Lateral line 22; scales 44 or 45.

Head 1½ times longer than broad. Diameter of eye 1½ in snout, 5½ in head, and 1¼ in interorbital width. Maxillary reaching to under middle of eye. The cranial ridges and spines are broken up into many small spines. Interorbital with a rather deep channel. Pit at occiput broader than long. Under the anterior part of the eye is a deep pit. No teeth on palatines. Second anal spine somewhat longer, though not stronger than the third.

Color deep gray with broad, dark, diffused cross bands; under side of head dark; all of the fins clouded with dark; posterior half of caudal with a broad, dark cross band, which is crossed with light, wavy lines; inner side of pectoral light blue, anteriorly with dark spots; posterior edge of pectoral with a broad dark border. (Steindachner and Döderlein.)

This species may be known from *Scorpænopsis cirrhosa* by the long pectoral, which is shown in the plate to reach to above the second or third anal spine, and by the serrated cranial ridges. It is not represented in our collections.

(Kagoshima, basket-island, a port in Satsuma, in southern Japan, noted for the richness of its fish fauna.)

10. SETARCHES Johnson.

Setarches Johnson, Proc. Zool. Soc. Lond., 1862, p. 177 (*guntheri*).

Bathysebastes Steindachner and Döderlein, Denschr. Akad. Wiss. Wein, 1884, p. 207 (*albescens*).

Head and body compressed; head scaleless above, its bones cavernous; only 1 pair of spines at occiput; no transverse groove at occiput, only small spines or none above orbit; opercle and preopercle strongly armed with straight, long spines. Eye moderate, near, but not touching, profile. Mouth terminal, broad, somewhat oblique; maxiliary extending to posterior edge of eye, much expanded behind. Lower jaw somewhat projecting, the small symphyseal knob received in rostral notch. Villiform teeth on jaws, vomer, and palatines. Preorbital with 2 or 3 spines. Opercle scaly. Scales cycloid, moderate. Lateral line a broad, scaleless groove with dermal (about 27 to 30) tubes. No dermal flaps. Dorsal deeply notched, with 12 spines, its origin in front of pectoral; soft dorsal shorter, the rays fewer than the spines. Anal inserted under end of dorsal, its spines strong, graduated. Pectoral broad and bony, with 20 or more rays, of which a considerable number of median ones are branched. Branchiostegals 6 or 7. Pyloric appendages few. Deep water.

(Etymology not obvious.)

34. SETARCHES ALBESCENS (Steindachner and Döderlein).

SHIRO KASAGO (WHITE ROCK-FISH).

Bathysebastes albescens Steindachner and Döderlein, Fische Japans, III, 1884, p. 207; off Tokyo.

Setarches albescens Steindachner, Fische Japans, IV, 1887, p. 39, same specimens.—Jordan and Snyder, Check List, 1901, p. 99.

Head $2\frac{2}{5}$ in length without caudal; depth $3\frac{1}{5}$. Dorsal XII, 10; anal III, 5. Pores of lateral line 27, series of scales below lateral line running downward and backward, 58. Eye $4\frac{1}{2}$ in head; interorbital width $4\frac{2}{3}$; maxillary $1\frac{9}{10}$; third anal spine $3\frac{1}{6}$; second anal spine $4\frac{1}{5}$.

Lower jaw projecting; symphyseal knob moderate. Mouth large; maxillary projecting to below posterior rim of orbit. Eye much shorter than snout. Teeth in very narrow bands. Interorbital space rather wide and convex, the bones of top of head very cavernous. Nasal spines very tiny; preocular spines small, but sharp, scarcely rising above surface of superocular rim, but slightly projecting laterally; parietal spines preceded by very low, scarcely evident ridges; a low ridge running backward from upper third of eye and ending in a small spine above preopercle ridge.

Opercle with two ridges originating at a common point near preopercle ridge, diverging, and ending in 2 sharp spines near edge of opercle. Preopercle with 5 long spines, the next to the upper one the largest, its length from preopercle ridge five-sixths of diameter of eye; the next below and the upper one subequal, the upper one on a level with suborbital ridge, the lowest one pointing downward. Preorbital with 3 large sharp spines; the posterior one the largest and pointing somewhat backward, the anterior one pointing almost directly forward, and the middle one slightly forward. A slit behind last gill arch, half the diameter of the eye in length. Gill-rakers rather short and slender, widely spaced, the longest one-third eye; 10 of them on anterior limb of arch.

Scales thin and cycloid. Head naked everywhere, except on opercle and cheeks, where the scales are inconspicuous. Fins naked.

Pectoral reaching to above base of first soft ray of anal, outline of pectoral rounded, its lower rays swollen, but only the lower three or four simple; it has 21 rays. Ventrals reaching three-fifths of the distance from their base to front of anal. Fourth dorsal spine four-fifths length of longest dorsal rays, $3\frac{1}{2}$ in head; the eleventh 9 in head. Caudal truncate, or very slightly rounded, $1\frac{5}{6}$ in head. Peritoneum white.

Alcoholic specimen showing scarcely any color; a little brown pigment on back, a few dots in front of pectoral and cheeks, a dark shade on opercle, caused by dusky lining of opercles showing through; fins colorless. They were doubtless red in life.

Here described from a specimen 22 cm. in length. The picture of this species given by Steindachner and Döderlein, Kentniss der Fische Japans (IV), Plate I, agrees very well with our specimen.

This species is known to us from several specimens in the Imperial University Museum, one of which was presented to the Leland Stanford Junior University Museum, taken in deep water off Misaki. It was dredged by the U. S. Fish Commission steamer *Albatross* at Station 3729, off Omai Point, Totomi, in 34 fathoms.

(*albescens*, whitish.)

11. LYTHRICHTHYS Jordan and Starks.

Lythrichthys JORDAN and STARKS, new genus (*eulabes*).

This genus differs from *Setarches* chiefly in having the interorbital concave, the head more strongly armed with spines, the next to the upper preopercle spine (which in *Setarches* is the largest one) scarcely developed, with one less dorsal spine, and the last spine not longer than the one preceding it. The notch between dorsals is very deep, almost separating them.

Small species of the sea bottom in rather deep water.

(λύθρον, gore, from the red color; ἰχθύς, fish.)

35. LYTHRICHTHYS EULABES Jordan and Starks, new species.

Head 4¼ in length, without caudal; depth 3. Dorsal XI, 10; anal III, 5. Pores of lateral line 26. Eye 4 in head; interorbital 3¾; maxillary 2.

Body shaped as in the shorter species of *Sebastodes;* the back arched,

FIG. 11.—LYTHRICHTHYS EULABES.

highest at first dorsal spines, and the ventral outline from isthmus to anal straight.

Head large, wider than body. Mouth little oblique, the tip of premaxillary on a level with lower margin of orbit; maxillary extending to below posterior orbital margin. Lower jaw slightly projecting and with a small knob at symphysis, its tip fitting into a rostral notch. Teeth in narrow bands on jaws, vomer, and palatines. Interorbital space concave; at its middle a pair of interorbital ridges with rather a wide channel between. Nasal and preocular spines small, but rather sharp; superocular and postocular spines smaller and blunt, represented by notches in the superorbital ridge; parietal ridges moderately high and sharp, ending in rather blunt, small spines. Preopercle with 5 spines, the uppermost the longest, long and sharp, projecting beyond

preopercle edge, a distance equal to half the diameter of eye, the middle one but little shorter, the one between very short, triangular, as wide at its base as it is long, the lowest short, rather sharp and hooked forward. Preorbital armed with 3 long, sharp spines, the anterior one directed forward, the posterior one downward and backward, and the middle one downward. Opercle with 2 ridges radiating from a point near opercle and ending in spines. Gill rakers slender and moderately long, 10 on anterior limb of arch.

Scales very thin and cycloid. Head naked except cheeks and opercle. Lateral line with large dermal tubes. Fins naked.

Pectoral reaching to above middle of anal base. Ventrals nearly reaching vent. Dorsals nearly separated; last 3 spines not graduated in size, last 2 very tiny and subequal in length, the preceding one twice as long; the fourth spine longest, $2\frac{1}{2}$ in head. Peritoneum white.

Body (red in life) with dots of dark brown scattered sparsely over it. Spinous dorsal dusky; other fins colorless, doubtless red in life. One small specimen 48 mm. in length, dredged by the U. S. Fish Commission steamer *Albatross* (at 3708) in Suruga Bay, off Ose Point, in 60 to 70 fathoms. It bears the number 50910 in the U. S. National Museum.

(*ἐυλαβής*, wary.)

12. PTEROIS Cuvier.

Pseudomonopterus Klein, Missus. Pisces, V, 1756, p. 76 (nonbinomial) (*volitans*).
Pseudopterus Klein, same type.
Les Pterois Cuvier, Règne Animal, 1st ed., 1817, p. 286 (*volitans*).
Pterois Oken, Isis, 1817, p. 1182, same type.
Pterois Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 351 (*volitans*).
Macrochyrus Swainson, Nat. Hist. Classn. Anim., II, 1839, p. 264 (*miles*).
Pteroleptus Swainson, Nat. Hist. Classn. Anim., II, 1839, p. 264 (*longicauda*).
Pteropterus Swainson, Nat. Hist. Classn. Anim., II, 1839, p. 264 (*radiata*).

Body elongate, compressed, covered with moderate or small-sized scales, which are usually not ciliated. Bones of head well armed; the upper surface of head with cirri; opercle with a spine; mouth large, with teeth on jaws and vomer, none on palatines; dorsal fin elevated, with 12 or 13 spines, which are slender, sharp, and joined by membrane only at base; soft dorsal with branched rays; anal with three spines and 6 to 8 branched rays; caudal rounded or truncate; ventral moderate, or long, the rays I, 5. Pectorals greatly elongate, the rays simple and largely free from the base, the tips reaching to or beyond the caudal fin.

Species of rather large size, abounding about the coral reefs in the tropical Pacific, dreaded by fishermen on account of their venomous spines. The coloration is very showy, most of the species being yellowish with dark bands.

(*πτερόν*, wing.)

a. Dorsal spines 13; scales not ciliated.

b. Scales very small, in 95 transverse series, 14 scales between median dorsal spines and lateral line; soft parts of vertical fins with brown spots; ventrals with yellow spots; pectoral rays about 15 ..... *volitans*, 36.

bb. Scales larger, "in 70 transverse series" (39 as usually counted); 8 scales between median dorsal spines and lateral line; soft parts of vertical fins faintly spotted; ventrals with dusky spots; pectoral rays about 13..... *lunulata*, 37.

36. PTEROIS VOLITANS (Linnæus).

MINOKASAGO (RAIN-COAT ROCKFISH) LION-FISH.

Gasterosteus volitans Linnæus, Syst. Nat., 10th ed., I, 1758, p. 296, after *Perca dorso-monopterygio, capite cavernoso* of Gronow, Mus. No. 191.

Pterois volitans Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 352, fig. 88; Molucca, Amboyna, Ile de France, Bourbon, Ceylon, Red Sea, Seychelles, Pondicherry.—Günther Cat. Fishes, II, 1860, p. 122; Cape of Good Hope, Madras, China, Amboina, Sydney, Cape Upstart, Fische der Südsee, 1875, p. 81; Palau Is., Tahiti.—Ishikawa, Prel. Cat., 1897, p. 50; Miyakoshima, Riukiu Islands.

Pseudomonopterus volitans Bleeker, Acad. Roy. Sci. Amst., 1876, p. 44.

Scorpæna miles Bennett, Fishes Ceylon, 1828, p. 2, Ceylon.

Pterois muricata Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 363, Red Sea.

Pterois geniserra Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 366, Ava.

This species is thus described by Günther:

D. XII, I, 11; A. III, 6 or 7; scales 90, pyloric cæca 3; vertebræ 10+14.

Nape naked, space between eyes very concave, the width equal to the diameter of the eye which is 1¾ in snout. Pectoral fins reaching to or beyond the caudal fin. Color red; snout, head, and whole body with a great many blackish cross-streaks; all the rays of vertical fins spotted, the spots on the pectorals and ventrals larger and between the rays.

This species is very widely diffused throughout the East Indies. Two specimens from the Riu Kiu Islands, one being from Miyakoshima, are in the Imperial Museum of Tokyo. Another specimen is from Ogosahara in the Bonin Islands. There is no other certain record from Japan.

(*volitans*, flying.)

37. PTEROIS LUNULATA Schlegel.

MINOKASAGO,[a] YAMANOKAMI (MOUNTAIN WITCH).

Pterois lunulata Schlegel, Fauna Japonica, Poiss., 1843, p. 46, pl. xv; Nagasaki.—Richardson, Ichth. China, 1846, p. 213; Canton.—Bleeker, Verh. Kon. Ak. Wet., I, about 1862, p. 3; Japan.—Günther, Cat. Fish., II, 1860, p. 124; Japan.—Steindachner and Döderlein, Fische Japans, II, 1884, p. 31;

[a] Mino means Japanese rain coat. Kasago is an ancient name applied to *Sebastiscus marmoratus*.

Tokyo.—Ishikawa, Prel. Cat., 1897, p. 50; Tokyo, Enoshima.—Jordan and Snyder, Check-List, Fishes Japan, 1901, p. 99; Tokyo.

Pseudomonopterus lunulatus Bleeker, Ac. Roy. Sci. Amst., 1876, p. 47; Japan; Singapore.

Head $2\frac{5}{8}$ in length without caudal; depth 3; dorsal XIII, 12; anal III, 8. Scales 39; pores of lateral line 23. Eye 5 in head; interorbital $4\frac{1}{2}$; snout $2\frac{1}{2}$; maxillary $2\frac{1}{6}$.

Lower jaw not projecting; symphyseal knob well developed; tip of lower jaw fitting into a deep, toothless, rostral notch, but without teeth developed in a knob at tip. Palatines toothless; vomer with a triangular patch of teeth; moderate bands of villiform teeth in jaws. Maxillary reaching to below anterior edge of pupil; backward extending processes from premaxillaries forming a conspicuous bunch on snout, and making a notch in upper profile between them and raised supraorbital rim. Nasal spines small and sharp; preocular spines when present very small, sometimes absent; a small knob of bone present just behind preocular spine on supraorbital rim, to which supraorbital filament is attached; a rather sharp, triangular, postocular spine present; parietals with very high sharp ridges ending in a spine; a nuchal spine close behind; 2 spines behind eye in a line with lateral line; suborbitals with a slight ridge broken up into 2 small spines; preopercle with 3 spines and a rudimentary one below; the upper one the largest. Preorbital with an anterior low rounded lobe and 2 angulated filament-bearing lobes behind; no spines. Interorbital space very deeply concave and with two slight ridges, between which is a shallow wide channel. Supraorbital filament small in the adult, long in young examples (in a specimen 17 cm. in length they are as long as the interorbital width); a long filament on posterior angle of preorbital, longer than diameter of eye, and a smaller one, scarcely a third as long, on angle at middle of lower edge of preorbital; 2 filaments on lower edge of preorbital; a filament on posterior edge of anterior nostril. Gill-rakers very short, 10 of them on anterior limb of arch. Snout, occiput, mandible, maxillary, and interopercle naked; opercle, cheeks, and interorbital with scales; the scales on interorbital very fine.

Length of pectoral varying with size and sex; in male examples 21 cm. in length it reaches to middle of caudal rays, in those from 14 to 16 cm. it reaches to the tip of the caudal; in a female 21 cm. in length it barely reaches to base of caudal. The tips of the pectoral rays are filamentous in males; in females a broad thin membrane, free on the lower edge, extends to the tips of the upper pectoral rays. Membrane of upper pectoral ray incised about to the basal fourth of the second ray; that of second ray about to basal two-fifths of third ray; that of third to basal two-thirds or three-fourths of fourth; the membrane of the upper 3 rays is incised to the next ray below each,

each ray bearing the free membrane only on its lower edge; the membrane between the other rays is notched, each ray bearing an equal share of the free membrane. Dorsal spines of males longer than those of females, and the membrane growing gradually less to tip of spine; in females the membrane is wider and is of same width nearly to tip of spine; fifth, sixth, seventh, and eighth spines subequal; the second, third, and fourth growing slightly and gradually shorter anteriorly; the first abruptly shorter, three-fifths the length of fifth; the ninth, tenth, and eleventh growing gradually shorter; the twelfth and thirteenth abruptly shorter, the former 2½ times in fifth. Ventrals reaching to front of anal. Caudal rounded, as long as head. Peritoneum white.

Color in spirits: Body crossed with many dark brown or blackish narrow bars across light ground. Interorbital space with a dark longitudinal stripe running from behind eye to premaxillary processes, where it meets a V-shaped mark; a band from supraorbital rim to anterior preorbital barbel; two or three short ones before it; a band crossing iris and running downward from eye; three narrower ones in front of it radiating from eye; a band across occipital region just behind eye, continuous with its fellow of the opposite side, running obliquely backward across preopercular spines to edge of opercle; a narrower one in front of it; a band across parietal ridges running obliquely backward to edge of opercle to above base of upper pectoral ray; one or two shorter ones in front of it and three behind; a wide band from second dorsal spine crossing a conspicuous dark spot behind opercular flap and extending on axil; parallel to the last is a narrower band from third spine crossing body; a shorter, still narrower streak just in front of it; a wide band from fourth dorsal spine running downward and back parallel to the last and meeting a similar band from sixth spine running straight downward at a point some distance below lateral line, inclosing a short streak from fifth spine which stops at lateral line; behind this bands are parallel and run straight downward; a moderately wide one from eighth spine; a wider one from tenth; three narrow ones from eleventh, twelfth, and thirteenth spines, the middle one the widest; a wide one from second ray; a narrower one from fourth; a wide one from seventh, and a very narrow one under last ray. All of these bars involve membrane of spinous dorsal or base of soft dorsal. Two stripes across caudal peduncle and one at base of caudal rays. Each dorsal spine with three or four large dark spots having an interval between each equal in width to the spots. Each ray of pectoral crossed with several large spots equal in width to interval between; their edges soft and blended; on the membrane at each side they run obliquely backward. Rays of ventrals crossed by four or five distinct but irregular dark bars, which usually cross the membrane, but sometimes are broken between each ray. Small examples with distinct small black spots on dorsal, anal, and caudal, which

disappear more or less on the larger ones, though usually traces of a few of them remain.

Except where otherwise stated, measurements in this description were taken from male specimens 21 cm. in length. Specimens were collected by Jordan and Snyder at Tokyo, Misaki, Yokohama, and Wakanoura. It is a rather common market fish, but in market specimens the first dorsal is removed by the fishermen, who dread its sting.

(*lunulatus*, crescent-shaped.)

13. EBOSIA Jordan and Starks.

Ebosia JORDAN and STARKS, new genus (*bleekeri*).

This genus is allied to *Pterois*, differing in the shorter pectoral, which barely reaches the base of the caudal, and in which the rays are united by membrane nearly to their tips. From *Dendrochirus* Swainson, with which genus it agrees in these respects, it differs in the presence of a large saber shaped angulated ridge of bone rising on each side of the nape. The dorsal spines are high and joined by membrane nearly to their tips. The scales are large and rough. The single known species is thus far known only from Japan.

(Eboshi, an ancient Japanese helmet or head-dress shaped like the nuchal appendages in this genus, hence the vernacular name of Eboshi-Kasago.)

38. EBOSIA BLEEKERI (Steindachner and Döderlein).

EBOSHIKASAGO (HELMET ROCK-FISH).

Pterois bleekeri STEINDACHNER and DÖDERLEIN, Fische Japans, III, 1884, p. 32, pl. VI, fig. 1, 1a; Tokyo.—ISHIKAWA, Prel. Cat., 1897, p. 50; Tokyo.—JORDAN and SNYDER, Check List, 1901, p. 99; Tokyo.

Head $2\frac{3}{5}$ in body; depth $2\frac{5}{7}$. D, XIII, 9. A, III, 7. P, 16. Eye 4 in head, snout $3\frac{1}{2}$.

Maxillary extending to middle of eye; occipital crest, thin, lunate, varying in height; perhaps smaller in females; upper orbital margin irregularly toothed; tentacles all short over eye on anterior nostril on preorbital and preopercle. Interorbital space scaleless. Cheeks, opercle, and sides of posterior part of head with rough persistent scales. Preorbital (in male) rough. Longest dorsal spine, not quite 3 in head. Pectorals not reaching caudal; ventrals usually reaching anal.

Color much as in *Pterois lunulata*, the fins yellowish, only the pectorals showing broad dark cross-bars. Posterior part of head with a dark band, which descends vertically to the posterior edge of opercle. Three dark bands radiating from eye. (Steindachner and Döderlein).

This species is known to us from a single example found in the market at Tokyo by Mr. Otaki. It is very well figured by Steindachner and Döderlein.

(Named for Pieter van Bleeker).

14. APISTUS Cuvier.

Apistus Cuvier, Règne Animal, 10th ed., 1828 (*alatus*).
Pterichthys Swainson, Nat. Hist., II, 1839, p. 265 (*carinatus*).
Polemius Kaup, Wiegman's Archiv. 1858, p. 333 (*alatus*).

Body oblong, compressed, covered with moderate or small scales. Head without spinous crests above, the sides rough. Orbit serrate. Preorbital with three spines, the posterior elongate and directed backward; preopercle with 4 to 6 spines; opercle with 2. Mouth large; teeth on vomer and palatines. Dorsal fin long, beginning behind the eye, deeply notched, the spines 15, the soft rays 7 to 9; anal rays III, 7 or 8. Pectorals elongate, acute, of 11 rays, connected by membrane, the lower ray free. Ventral rays I, 5. Caudal fin rounded. Small fishes of the coasts of southern Asia, notable for their long pectoral fins and for the envenomed dorsal spines.

(ἄπιστός, perfidious.)

a. Scales about 72 in lengthwise series; maxillary 2½ in head; caudal fin with 6 or 7 narrow cross bands ..... *evolans*, 39.
aa. Scales about 60; maxillary 2¼ in head; caudal with three broad irregular dark bars ..... *venenans*, 40.

39. APISTUS EVOLANS Jordan and Starks, new species.

HIREKASAGO (LONG-FINNED ROCK-FISH).

Apistus alatus Bleeker, Ac. Roy. Sci. Amst., 1876, p. 59, pl. III, fig. 2; Kiusiu (not *Apistus alatus* Cuvier and Valenciennes, *Apistus carinatus* Bloch and Schneider).—Ishikawa, Prel. Cat., 1897, p. 50; Sagami Bay.—Jordan and Snyder, Check List, 1901, p. 99.

Head 2⅞ in length without caudal; depth 3⅘; dorsal XV, 9; anal III, 8; scales 72, counting series above lateral line running down and forward. Eye 4⅓ in head; maxillary 2⅔; interorbital 10.

Lower jaw with a well-developed knob at symphysis strongly projecting and sharp at tip, fitting into a deep rostral notch. Mouth oblique, the front of premaxillaries on level with lower margin of pupil. Posterior margin of eye nearer tip of snout than end of opercular flap by a diameter of the pupil. Maxillary scarcely extending to anterior margin of pupil. Teeth on premaxillaries in a narrow band widest at sides, becoming narrow and pointed in front; a wide toothless interval in front; band of teeth on lower jaw scarcely wider in front; the palatine and vomerine bands very narrow; those on the vomer in a sharply curved band which is widest at the ends. Interorbital narrow and deeply concave, having parallel interorbital ridges with a narrow channel between, the ridges curve outward behind the eye and are continuous with the sharp parietal ridges. Suborbital plates very wide, as wide as diameter of eye and covering cheek, their surface roughened with radiating ridges, as is that of opercle; along their center is a very slight ridge continuous with large preopercular

spine. Preopercle with a long sharp spine and 4 blunt triangular ones below, these not on preopercular ridge but on wide flat produced edge of preopercle; the next to the upper of the lower blunt spines the largest, the lowest but little developed. Opercle with 2 flat slight spines. Preorbital with a long curved spine at its posterior end reaching backward to end of maxillary, and a pair of small spines at its anterior end directed forward. Parietal ridges not ending in spines. From the upper posterior border of the eye a low broken ridge runs to the anterior end of the lateral line. Superior anterior border of eye denticulate. A long tentacle on each side of lower jaw three-fourths of diameter of eye from its tip, and a smaller one at its tip. Pseudobranchiæ large; a short slit behind last gill; gill-rakers long and slender, the longest a little over half the diameter of eye; 16 of them on anterior limb of arch. Lower jaw and lower part of pre-

FIG. 12.—APISTUS EVOLANS.

opercle thickly covered with very small pores. Head naked, except a little patch on cheek below suborbital stay and behind maxillary.

Body, breast, and isthmus everywhere evenly scaled; scales thin and not rough to the touch, but appearing under the lens coarsely toothed. Lateral line straight, not following contour of back. Fins naked.

Pectoral reaches to within half the diameter of the eye to the base of the caudal rays. Pectoral rays all branched except a couple of the short lower ones; number of rays 10; the upper one the longest. Detached pectoral ray equal to distance from tip of snout to tip of large preopercular spine. Ventrals reaching past vent but scarcely to front of anal. Fourth dorsal spine 2 in head; from the fourth to the tenth or eleventh spine the spines are subequal; the first is 2½ in head, equal to the last; the next to the last the shortest, 4 in head. The second dorsal ray the longest, 1⅓ in head; when fin is depressed none

of the rays reach past the tips of the second and third; tips of last rays reach base of caudal; tips of the longest reach half the diameter of the eye past base of caudal. Anal spines graduated in length, the first equal to the diameter of the eye, the third twice as long. Longest anal ray 1⅔ in head, and reaching to base of caudal. Caudal rounded.

Color: Under part of head, base of pectoral, and small area behind pectoral white; sides of head silvery; lower part of body light, probably silvery; back a uniform light brown becoming lighter below and shading to the light lower parts; top of head and snout marbled with vermiculated light streaks; a broad light band across nape, bordered with white at ends of parietal ridges and in front of first dorsal spine; membrane of spinous dorsal white, mottled with darker; a small black spot on membrane behind first spine; an oblong jet-black spot on middle of spines from ninth to twelfth spine entirely surrounded with pure opaque white; soft dorsal crossed by irregular brown and white streaks; pectoral jet black, its upper and lower ray light; detached pectoral ray white; pectoral soiled white on inner surface; ventrals white, slightly dusky toward ends of rays; anal white with a black band in sharp contrast becoming wider behind and including within its borders some large spots of the white ground color; caudal crossed by 6 or 7 narrow irregular wavy brown bands, with white intervals of equal width. Peritoneum white.

This species differs from *Apistus venenans* in having the scales smaller, maxillary shorter, eye smaller, interorbital narrower, dorsal spines higher, head rougher, preorbital spine longer, and the color different, especially the pattern on caudal.

A single specimen, the type, collected at Tokyo by Professor Otaki, is 15 cm. in length, and is numbered 7393, ichthyological collections, Leland Stanford Junior University Museum.

(*evolans*, flying away.)

40. APISTUS VENENANS Jordan and Starks, new species.

Apistus alatus SCHLEGEL, Fauna Japon. Poiss., 1843, p. 49, pl. XXII, fig. 2; Nagasaki (not of Cuvier and Valenciennes, whose types came from Pondicherry=*Apistus carinatus* Bloch and Schneider).—STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1884, p. 200; Kagoshima, Kochi.

Head 3⅔ in length without caudal; depth 3½. Dorsal XV, 9; anal III, 8. Scales 60, counting series above lateral line running downward and forward. Eye 4 in head; maxillary 2¼; interorbital 9.

Lower jaw projecting and fitting into a rostral notch. Posterior margin of eye midway between tip of snout and end of opercular flap. Maxillary reaching just past front of pupil. Teeth in very narrow bands; narrower on palatines and vomer than on jaws; the bands on premaxillaries narrower and pointed in front, and separated from each other by a wide toothless area. Interorbital narrow and concave and

having a narrow channel between the slight interorbital ridges. Suborbital plates very wide, covering cheek, a slight ridge along them continuous with ridge from large preopercular spine; the plates otherwise smooth. Opercle with 2 small spines at the ends of slight ridges. Preopercle with a long sharp spine and 4 short blunt ones below, the largest forming an angle. Preorbital with a pair of small spines anteriorly pointing forward, and a long, sharp, curved spine posteriorly which fails to reach the end of the maxillary by a distance nearly equal to diameter of pupil. Parietal ridges not bearing spines. From upper posterior border of eye a slight broken ridge runs to beginning of lateral line. Superior anterior border of eye denticulate. A long tentacle at tip of mandible and one on each side of similar size half the diameter of the eye behind it. Pseudobranchiæ large; a small slit behind last gill arch; gill-rakers slender, equal to half eye; 14 of them

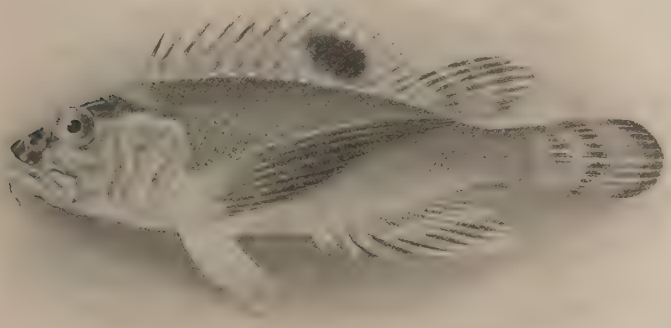


FIG. 13.—APISTUS VENENANS.

below angle of arch. Head entirely naked, except a small patch of scales on cheek below suborbitals and just behind maxillary.

Body, breast, and isthmus evenly scaled with soft pectinate scales. Lateral line straight. Fins naked.

Pectoral reaches to just past base of dorsal or to within a diameter of eye of caudal base; number of rays 10, all branched except a couple of the lowest short ones, the upper ray the longest. Detached pectoral ray $1\frac{2}{3}$ in head. Ventrals reaching to base of second anal spine. Fourth dorsal spine $2\frac{2}{3}$ in head; last spine $3\frac{1}{3}$; next to the last $3\frac{1}{2}$. Tips of dorsal rays reach past base of caudal. First anal spine equal in length to the diameter of the eye, the third twice as long, and the second in length midway between. Caudal rounded.

Color: Lower parts of head and body white, sides of head silvery; back and sides of body uniform light brownish, shading gradually to the white of lower parts; a broad dark band across top of head, extend-

ing down on the sides to upper margin of pupil, its anterior edge above middle of eyes, its posterior edge at posterior end of parietal ridges, giving place to a light crescent in front of dorsal spine; it is irregularly vermiculated with white lines, and between the parietal ridges is a white spot; snout dusky; a dark band running anteriorly from eye; membrane of spinous dorsal white, mottled with dark, a dark spot between first and second spine, and a large black spot between eighth and thirteenth spines surrounded by white; soft dorsal with 3 or 4 dark bands across rays with intervals of white between equal to them in width; pectoral jet black on outer surface, white on inner; detached ray white; ventrals white, dusky toward tips, extreme tips white; first 2 anal spines white, the rest of fin dusky and with a darker band across middle of rays; caudal crossed by 3 rather broad irregular bars, the one at tips of rays darker, between them 3 white bands, equal to them in width, the first across base of rays. Peritoneum white.

The following color note made from a fresh specimen: Color brown; pale markings, dirty white; dark ones brown or black; no red or yellowish.

This species differs from Day's description of specimens from the Indian Ocean, particularly in not having the parietal ridges ending in spines, and from his plate in having the soft dorsal much higher, the first dorsal spine lower, in having the black dorsal spot surrounded by white, not shading into a dusky band along entire top of spinous dorsal, and in having no red or yellowish in life.

The type and single specimen taken at Nagasaki. It is 105 mm. in length and is numbered 7371 Ichthyological Collections, Leland Stanford Junior University Museum.

It is apparently the species described as *Apistus alatus* by Schlegel, while Bleeker's figure seems to belong rather to *A. evolans*. Both seem to be distinct from *Apistus carinatus*=*A. alatus* of the East Indies.

(*venenans*, poisoning).

15. MINOUS Cuvier and Valenciennes.

Minous Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 420 (*woora*).
Corythobatus Cantor, Cat. Malayan Fishes, 1850, p. 45 (*woora*) (*Minous*, supposed to be preoccupied by the prior name *Minois*).

This genus differs from *Apistus* chiefly in the absence of scales, the skin being smooth. The head has rough crests above and the preorbital has 2 diverging spines. Preopercle with 4 or 5 spines; 2 opercular spines; mouth moderate; lower jaw with slender cirri. Teeth on the vomer, none on the palatines.

Fin rays all simple. Dorsal with 10 or 11 stiff spines and 9 to 11 rays, the fin beginning behind the eye. Anal spines flexible; the rays

II, 9. Ventral rays I, 5. Pectoral fins moderate, the lower ray free. Small fishes of the East Indies.

(*woora-minoo*, a Hindu name given by Russell.)

a. Lower preopercular spine truncate; ventrals reaching front of anal; caudal with 2 broad, dark bars ..... *adamsi*, 41.

aa. Lower preopercular spine hooked backward; ventrals scarcely reaching vent; caudal with irregular bars ..... *echigonius*, 42.

41. MINOUS ADAMSI[a] Richardson.

OKOZE.

Minous adamsi Richardson, Voy. Samarang, 1850, p. 7, pl. II, figs. 4, 5; Sea of China.

Head (exclusive of projecting lower jaw) $2\frac{4}{5}$ in length without caudal; depth 3. Dorsal X, 11; anal 11 or 12. Eye 4 in head; maxillary $2\frac{1}{3}$.

Lower jaw strongly projecting and entering into the upper profile. Teeth in narrow bands on jaws in two widely separated patches on vomer. Maxillary extending to below front margin of pupil. Interorbital wide and concave, having a pair of ridges with a channel between, along which runs a slight median ridge which divides and diverges posteriorly; interorbital width $1\frac{1}{4}$ in length of orbit.

Preorbital with a long sharp posterior spine which reaches nearly or quite to end of maxillary, and a small spine in front pointing downward. Preopercle with 6 spines, the upper one short and triangular, directed slightly upward; the next below by far the longest and very sharp, reaching to edge of opercle; the two next below short and rather blunt, and the lower two directed downward and truncate at their tips. Bones of head, where they appear, everywhere rough and deeply sculptured; the suborbitals are wide, rough, bony bucklers bearing a prominent but blunt ridge, a transverse depression on top of head behind eye separating the postorbital from the interorbital region. Parietals produced in wide, blunt, rough ridges, which end behind in blunt spines. A similar ridge on side of head behind eye extending out on post-temporal and ending in a spine. Post-temporals apparently firmly joined to cranium. Nasals ending above in

[a] The following is the synonymy of the closely related Indian species, *Minous monodactylus* (Bloch and Schneider):

Scorpæna monodactyla Bloch and Schneider, Syst. Ichth., 1801, p. 194.

Minous monodactylus Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 424, pl. LIX, fig. 2.—Günther, Cat. Fish, II, 1860, p. 148; Madras, Borneo, China.—Bleeker, Ac. Sci. Roy. Amst., 1876, p. 64; Java, Borneo, Celebes, Banka, Singapore, Sumatra, Pinang.

Apistus minous Cuvier, Régne Anim., 2d ed., 1828, after Russell.

Minous woora Cuvier and Valenciennes, Hist. Nat. Poiss., IV, 1829, p. 421; India (Woora-minoo of Russell).

Corythobatus woora Cantor, Cat., 1850, p. 45; Malay Peninsula.

produced angles, but not in spines, their upper edge denticulate, as is the entire supraorbital rim. A short slit behind last gill arch. Gill rakers very small and blunt, 9 or 10 of them on anterior limb of arch. A tentacle on middle of mandible below, and a smaller one midway between it and tip of mandible. Lower parts of head and isthmus, especially maxillary and lips, thickly covered with blunt, fleshy papillæ; upper parts more sparsely covered, and traces of them may often be made out with the aid of a lens, scattered over the body. Lateral line represented by 17 or 18 small inconspicuous pores.

First dorsal spine situated three-fifths or three-fourths the diameter of eye distant from the transverse ridge across top of head behind eye; the first spine the longest of the anterior spines, its length equal to distance from tip of snout to front of pupil; the last spine the longest, longer than the first spine by the longest diameter of the pupil. No notch between dorsal spines and rays, the longest of the latter much longer than the spines; the tips of the last rays reach past the base of the caudal. Pectoral reaching to above base of third or fourth anal ray; the pectoral rays all simple, 11 in number. Detached pectoral ray in large specimens (12 cm. in length) equal in length to distance from tip of snout to middle of eye; comparatively longer in smaller specimens usually not reaching front of anal. Ventrals usually reaching about to front of anal, adnate to body, except a small portion at ends of rays; free portion equal to diameter of eye. Caudal rounded. Distance from base of pectoral filament to anal nearly equal to head.

Color brownish above, usually with vermiculated diagonal or longitudinal light streaks above and below lateral line, but never crossing it; lateral line runs along a brown streak and often has a light streak above and below defining it; above the light and dark streaks extend on dorsal; lower part of sides, belly, and under part of head white; a black spot on membrane behind tip of each dorsal spine; a larger black spot across tips of first 3 or 4 dorsal rays; anal, ventrals, and pectoral black, shaded at base into the white of lower parts of body; the pectoral crossed by inconspicuous lighter vermiculated streaks, its inner surface white; caudal crossed by 2 wide solid dusky bands, separated by an interval narrower than themselves; these bands very constant; scarcely any variation in a hundred specimens examined. Peritoneum white.

Here described from specimens about 12 cm. in length. Upward of a hundred specimens were obtained by us from Onomichi, Nagasaki, Kobe, and Wakanoura. This species is closely allied to *Minous monodactylus* of the East Indies, differing in the stouter body shorter first dorsal species and in other details of color and structure. In Richardson's figure of *Minous adamsi*, the belly is shown as very short, the pectoral reaching middle of anal, the pectoral filament and

ventrals also past its front, the distance from base of filament to front of anal only about half head. His specimen was probably a shriveled male of this species. There is no previous record of this species from Japan, and this form belongs to a different faunal area. This is the common Okoze, or poison fish of the Inland Sea of Japan.

(Named for Arthur Adams, its discoverer.)

42. MINOUS ECHIGONIUS Jordan and Starks, new species.

Minous monodactylus Ishikawa, Prel. Cat., 1897, p. 49, No. 863; Niigata.

Head 2⅔ in length without caudal; depth 2⅔. Dorsal X, 11; anal 12. Eye 4½ in head; maxillary 2½. Lateral line with 17 pores.

Lower jaw strongly projecting, its tip sharply hooked up. Teeth in a very narrow band in lower jaw, scarcely wider in front, in a much wider band on premaxillaries, wider in front; teeth on vomer in 2

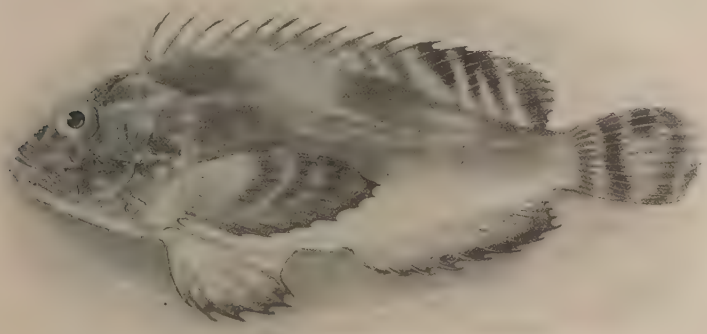


FIG. 14.—MINOUS ECHIGONIUS.

widely separated patches. Maxillary reaching to just past front of orbit. Interorbital wide and concave, the ridges as in *M. adamsi*, its width equal to diameter of orbit. Preorbital with a long, sharp posterior spine, which reaches nearly to end of maxillary, and a small spine in front which points downward. Preopercle with a long, slender, sharp spine, reaching nearly to margin of opercle; above it, a wide triangular spine; below it, 4 short spines, the upper of which is closer to the large spine than to the next below; it is short and not very sharp: the next below is slightly longer and sharper; the next, closer to it than to the next below, its point rather sharp and hooked backward; the lowest is smaller and is directed downward. Exposed bones and ridges of head rough and arranged as in *M. adamsi*. Last gill arch with a short slit behind it. Gill rakers short and blunt, 8 in number on anterior limb. A tentacle at middle of lower jaw below, a smaller one midway between it and tip of jaw, and several small ones

at tip of jaw. Head and especially lips and maxillary covered with small, fleshy papillæ.

Pectoral reaching to above base of second anal ray; detached pectoral ray equal to distance from tip of snout to posterior border of pupil. Ventrals adnate to body for nearly their whole length, their tips scarcely reaching to vent. Last dorsal spine the longest, $2\frac{2}{5}$ in head; the longest dorsal rays equal in length the length of snout and eye.

Color of type much faded; light brownish above; lower parts of body and head white; a light streak running along lateral line above and below leaves it in a dark streak; each dorsal spine with a brown spot on membrane behind its tip; soft dorsal with a large brown spot on distal ends of first 6 rays, the rays crossed by light streaks; pectoral dark brown on its outer surface, white on its inner; ventrals and anal dark brown at tips of rays, shading to the white of body; tip of caudal white, on distal third rays are crossed by a dark bar, which divides below; in front of it is a wide light interval with a brown spot in the middle; then a narrow, dark, irregular bar across middle of rays, and then a wide white area with traces of bars above and below. Peritoneum white.

This species is close to *Minous adamsi*, differing in having a smaller eye; the tip of the mandible more hooked upward; the lower preopercular spines hooked backward, rather than truncate; the maxillary slightly shorter; the ventrals shorter and more adnate; the posterior outline of soft dorsal more broadly rounded; and in having the caudal marked with irregular bars. In *M. adamsi* there is scarcely any variation in the 2 broad bars crossing the caudal.

The type is a specimen 115 mm. in length from Niigata, in Echigo, presented to us by Dr. Ishikawa, of the Imperial Museum of Tokyo. It is numbered 7380, Ichthyological Collections, Leland Stanford Junior University Museum. It was formerly No. 863, Imperial Museum.

16. DECTERIAS Jordan and Starks.

Decterias Jordan and Starks, new genus (*pusillus*).

This genus differs from *Minous* principally in having the dorsal spines slender and flexible, rather than stiff and sharp; a narrow, deeply concave interorbital region, and no enlarged posterior preorbital spine. Japan.

(δεκτερός, stinging.)

43. DECTERIAS PUSILLUS (Schlegel).

Minous pusillus Schlegel, Fauna Japonica, Poiss., 1843, p. 50; Nagasaki.—Günther, Cat. Fish, II, 1860, p. 149, copied.—Steindachner and Döderlein, Fische Japans, III, 1884, p. 297; Kagoshima.

Head $2\frac{2}{5}$ in length without caudal; depth $3\frac{2}{5}$. Dorsal IX or X, 10 or 11; anal 10. Eye $3\frac{1}{2}$ in head; maxillary $2\frac{1}{4}$.

The upper profile of head very much broken up, the superior postorbital region depressed anteriorly, leaving the supraorbital region much produced; a deep notch in front of orbital rim caused by the produced nasal region. Exposed bones of head very rough, the orbital rim denticulate; and 2 or 3 irregular denticulate ridges along suborbitals. Preorbital with 2 short spines, the anterior directed downward, the posterior downward and backward. Preopercle with a long, sharp spine above and 4 smaller ones below. Parietals very rough and produced behind in spines, a rough ridge running backward from posterior margin of eye. Mouth large; maxillary reaching to below front of eye. Narrow bands of teeth on jaws scarcely widened anteriorly; teeth on vomer in 2 small, widely separated patches. Interorbital space narrow and deeply concave; through it runs a pair of slight interorbital ridges, not very close together, its

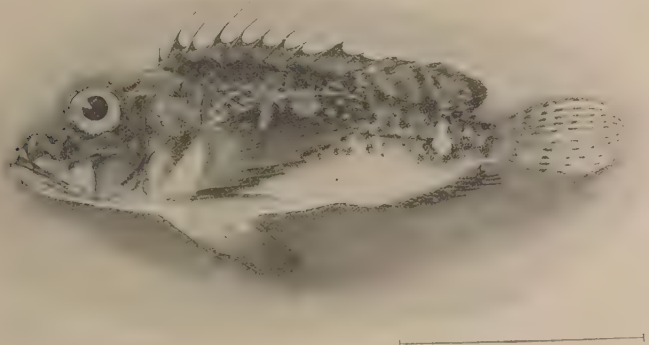


FIG. 15.—DECTERIAS PUSILLUS.

width three-fifths of orbit, or 6 in head. Middle of under part of mandible with a rather long barbel, and a smaller one between it and tip of mandible. Last gill arch with a short slit behind it; 8 or 9 short, blunt gill rakers on anterior limb of arch.

Pectorals reaching to or a little past front of anal, and having 10 simple rays; lower detached ray reaching to tips of ventrals. Ventrals reaching to vent; about half of last ray adnate to body. Dorsal spines long and hair-like; the third, or longest, equal to snout and half eye. No notch between dorsals. Caudal rounded.

Color in spirits: Finely mottled with slaty above, abruptly white on lower half of side and body; membrane of spinous dorsal black; soft dorsal crossed by irregular dark lines; pectoral black on outer face; inside sometimes black, sometimes with a tinge of white, but never strikingly white as in species of *Minous;* ventrals and anal black toward tips of rays, shading at base into the white of the under

parts of body; each ray of caudal with 5 or 6 small dark spots arranged to form irregular dark cross lines across fin. Peritoneum white.

About a dozen specimens were taken by Jordan and Snyder at Wakanoura, the longest 6 cm. in length.

(*pusillus*, feeble.)

17. EROSA (Swainson) Jordan and Starks, new genus.

Erosa Swainson, Nat. Hist. Classn. Anim., II, 1839, p. 61; diagnosis, no reference to type, *erosa* understood from context.

Synanchia "Swainson" Bleeker, Nat. Verh. Holl. Maats. Wetens., 1874, p. 11 (reprint) (*erosa*): (not *Synanchia* Swainson, which was a mere misprint or vagary of spelling for *Synanceia*).

Body short and thick, covered with naked skin, on which are skinny flaps. Head very large, cuboid, irregularly formed, with deep grooves and depressions. Eyes small; mouth large, almost vertical; teeth on the vomer, none on the palatine; preorbital with two strong spines; preopercle with 5 bluntish spines; bones of the skull very thick; top of head rough; a large quadrangular pit at the vertex. Dorsal fin continuous with 13 stout spines and 9 soft rays; none of the spines separated; dorsal fin beginning behind the nape; none of the fin rays filamentous. Anal short, with 3 distinct and 5 soft rays. Pectoral short without free ray. Ventrals moderate, the rays 1, 4. Caudal rounded, skin smooth.

A single species, distinguished from *Synanceia* (*horrida*) = *Synancidium* = *Bufichthys*, by the form of the head, by the absence of warts and fringes on the smooth skin of the body, and by the absence of a deep cavity below the eye. As originally presented, neither *Erosa* nor *Synanchia* seem to have any standing in nomenclature. The genus is however valid, and we may adopt *Erosa* as its name, unless *Erosia* (1857) be regarded as excluding it.

(*erosus*, ragged, gnawed out.)

44. EROSA EROSA (Langsdorf).

DARUMA,[a] DARUMAOKOZE, TOKENOKO (BAMBOO-SPROUTS).

Synanceia erosa Langsdorff, in Cuvier and Valenciennes Hist. Poiss., IV, 1829, p. 459; Japan.—Schlegel, Fauna Japonica, Poiss., 1843, p. 45, pl. xvii, fig. 1; Nagasaki.

Synanchia erosa Swainson, Nat. Hist. Classn. Fishes, II, 1839, p. 268. (Name only; misprint for *Synanceia*.)

Synancidium erosum Günther, Cat. Fish, II, 1860, p. 146; Japan.—Steindachner and Döderlein, Fische Japans, III, 1884, p. 31; Tokyo, Kagoshima.—Nystrom, Kong. Vet. Akad., 1887, p. 19; Nagasaki.—Ishikawa, Prel. Cat., 1897, p. 49; Kagoshima.

Head $2\frac{1}{6}$ in length without caudal; depth 2. Dorsal XIV, 7; anal III, 6. Lateral line with 11 pores. Eye $4\frac{2}{5}$ in head; maxillary $2\frac{1}{4}$;

[a] Daruma is the red-faced squatting figure of a Buddhist saint.

interorbital space $2\frac{1}{6}$. Head very large, as wide as deep and much wider than body, covered with coarsely sculptured bones, rough, blunt spines and ridges. Mouth very oblique, more nearly vertical than horizontal, the bluntly rounded lower jaw shutting into it and scarcely projecting, a knob developed at symphysis. Teeth in narrow bands on jaws and vomer; slightly wider in front, wider in front on premaxillaries than on mandible. Top of head between eyes nearly flat, anteriorly at each side are rough, square projections between which is a square opening for the reception of the processes from the premaxillaries; across interorbital space just behind middle of eyes is a rough transverse ridge separating a square, deep pit behind it from the premaxillary process pit; a similar transverse ridge is at occiput at the posterior end of quadrate pit; at the sides the ridges are depressed slighuly below the level of the occipital and interorbital ridges. The

FIG. 16.—EROSA EROSA.

parietals end in a triangular rough process, while more lateral and posterior is a larger but similar process (probably on post-temporal). Behind eye is a very rough broken ridge on a level with lateral line. Superorbital rim very rough. Preorbital with 3 blunt spines along anterior edge. Suborbitals widen posteriorly into a rough, bony buckler nearly covering cheek, at the center of which is a prominent blunt spine. Preorbital ridge with 3 spines; preorbital edge with 5 rather long blunt spines, the upper ones the largest, growing smaller below; in a line with them is a similar spine on outer angle of articular. Opercle with 2 spines at the ends of ridges.

Distance of dorsal from tip of snout contained $2\frac{3}{5}$ times in entire length without caudal. The last dorsal spine the highest, $3\frac{1}{4}$ in head; the anterior spines only a little lower; no notch between dorsals; the rays higher than the spines, $2\frac{3}{4}$ in head. Pectoral with 16 rays, all branched, its tip reaching to front of anal, its fourth ray from the top

the longest, 1½ in head. Ventrals short, having 1 spine and 4 rays, their length 2½ in head. Anal spines graduated in length, the soft anal rays much longer, 3 in head. Caudal short and rounded, equal to length of ventrals.

Body scaleless; 3 or 4 rows of wart-like papillæ scattered over the back, and a few smaller ones above anal.

Color in spirits: Back and sides light brownish; top of head at interorbital space and a spot at pterotic region frosted with white; from base of second to seventh dorsal spine a pinkish red band extends downward to lateral line, a similar one on last 3 spines and entire soft dorsal extends down nearly to anal; a pinkish band mixed with fine brown lines across basal half of caudal, and one across tips of rays leaving a white band between; middle of soft dorsal with a white band across all rays but last 2; pectoral brown, crossed by fine, dark brown lines, a white spot on upper rays; ventrals and anal similar to dark part of pectoral; traces of pink on interorbital and suborbitals.

A smaller specimen has the pink very bright, and in addition has pink on opercles, on occipital region, and on basal two-thirds of pectoral. Another specimen has much milk white about the head, and the lower parts of body are lighter.

A fourth specimen differs in being nearly uniformly dusky or blackish on back, and in having the lateral line running in a white streak; fins marked similarly, but with blackish instead of red or dark brown.

Several specimens from Misaki, the largest 120 mm. in length.

18. INIMICUS Jordan and Starks.

Inimicus Jordan and Starks, new genus (*japonicus*).

Body elongate, little compressed, anteriorly low, covered with smooth skin; head depressed, fantastically formed; body, head, and fins with skinny flaps; mouth small, subvertical; teeth on vomer, none on palatines; dorsal spines slender, about 17 in number, the 3 anterior separate from the rest, the others connected by membrane at base. Pectoral fin large, the upper rays not filamentous, the 2 lower rays detached, connected by membrane at base. Ventral rays 1, 5, the fin large. Fantastic, misshapen fishes often highly colored; dreaded by fishermen for their stinging spines. This genus differs from *Pelor* (*filamentosum*) chiefly in the absence of long filamentous tips to the upper rays of the pectorals. The head is more depressed and somewhat differently formed.

(*inimicus*, enemy.)

a. Color brownish or blackish with cross-bands of black or blood-red; orbital rim much elevated; a sharp ridge in front of orbital rim ..... *japonicus*, 45.

aa. Color orange with black spots, or else diffuse blackish shaded with orange; no distinct cross-bands; orbital rim and its ridges less elevated ..... *aurantiacus*, 46.

45. INIMICUS JAPONICUS (Cuvier and Valenciennes).

OKOZE, ONIOKOZE (DEVIL POISON-FISH).

Pelor japonicum CUVIER and VALENCIENNES, Hist. Poiss., IV., 1829, p. 437; Japan. Coll. Langsdorf.—SCHLEGEL, Fauna Japonica, Poiss., 1843, p. 44, pl. XVIII, fig. 2; Nagasaki.—RICHARDSON, Ichth. China, 1846, p. 212; Canton.—GÜNTHER, Cat. Fish, II, 1860, p. 151; Canton, Japan.—STEINDACHNER and DÖDERLEIN, Fische Japans, III, 1884, p. 197; Tokyo.—STEINDACHNER, Reise Aurora, 1897, p. 203; Kobe.—NYSTROM, Kong. Vet. Ak., 1887, p. 19; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 49, etc.; locality unknown.—JORDAN and SNYDER, Check List, 1901, p. 100; Yokohama.

Pelor tigrinum RICHARDSON, Ichth. China, 1846, p. 212; Canton.

Head 3 in length without caudal; depth, 3½. Dorsal XVII, 7; anal II, 9. Lateral line tentacles 15. Eye 7 in head; maxillary 2⅔.

Orbital rim and premaxillary processes more produced than in *I. aurantiacus*, the snout narrower, the distance across maxillaries just behind angle of mouth is half of length of head. The teeth similar. The arrangement of cranial spines and ridges the same, but they are much higher and sharper, the transverse ridge across posterior part of interorbital space is developed as a very high, sharp crest; a conspicuous sharp ridge runs from a tubercle in front of orbital rim inward in a curve along interorbital space nearly to transverse crest. (In *I. aurantiacus* this ridge is scarcely developed.) The interorbital space, the transverse depression, and the preorbital pits are deeper. The dermal fringes are arranged the same and are the same number and size.

Pectoral reaching to or a little past front of anal and having 10 rays. Ventrals adnate for their whole length, the membrane extending past the tip of the last ray nearly to the front of the anal. Anal spines short, their tips not projecting through the skin. Front of dorsal distant from tip of snout a space contained 4½ times in entire length without caudal. Caudal rounded.

Color in life dark brown, with cross bands of black or deep red. The specimen above described, in spirits, has alternate light brown and opaque pinkish red areas on back and sides, outlined with darker color; head almost entirely red down to branchiostegals, with irregular light brown spots outlined with dark brown; these mottling interorbital space and preorbital pits; a pair of them at occipital region, one on end of maxillary, a couple on opercle, and one on suborbital; cheek and snout nearly solid red; tip of mandible with a large red spot; anterior dermal fringes red; under part of head otherwise white or brownish, freckled with dark brown; the red of head extends back to third dorsal spine, involving the front of dorsal; behind which is an irregular brownish crossbar, involving dorsal to sixth spine and reaching to opposite anterior third of pectoral; next behind is a large red area containing some small light brown spots, extending on dorsal to

eleventh spine, extending down to just past middle of side, and sending an arm along middle of side back to a similar red spot from fourteenth spine to second or third soft ray, inclosing between a light brown spot which extends on dorsal; middle of soft dorsal crossed by a light brown band which extends down and is continuous with the light color of the lower parts; end of soft dorsal and base of caudal with a red bar; then a narrow white bar across caudal, followed by a wider red one, a white one across middle of rays, a still wider red and dark brown one, and the tips of the rays with a narrow white border; pectoral with a white bar across base of rays continuous with a similar bar obliquely across rays beyond their middle, inclosing a red spot above; posterior third of pectoral red; lower parts white, covered with large and small irregular brown spots; ventrals and anal similar, but darker with brown.

Another specimen has dark brown taking the place of the red of the head, with similar light brown spots; the lower parts nearly solid brown; the dark bands of pectoral and caudal dark brown, a tinge of red on the former, the red areas of back approximately in the same place, but more restricted by the brown color.

A third specimen has the head slaty black with the spots and mottling gray; the areas on back and fins, which were red in the first specimen, are here dusky or slate color, and those which were light brown are here gray; the lower part of side and belly is dusky, slightly brownish, and crossed in all directions by nearly straight white lines appearing like the cracks in old crockery.

Numerous specimens are in the collection from Tokyo, Tsuruga, Onomichi, Yohohama, and Kobe. The species is common throughout southern Japan, and is daily in the markets, usually with the spinous dorsal removed.

Measurements of Inimicus japonicus.

Length in mm. without caudal	150	165	195	145	163
Head in hundredths of length	36	35	35	34	35
Depth	33	28	28	29	32
Eye	5	5⅛	5	5⅛	5
Maxillary	16	16	16	15	16
Interorbital width	10	10¼	10	9	10
Width snout across maxillaries, just behind angle of mouth	18	18	19	17	19
Length of third dorsal spine	20	----------	18	19	18
Length of caudal	31	----------	28	31	29
Number of dorsal spines	XVII	XVII	XVI	XVII	XVII
Number of dorsal rays	7	7	8	7	7
Number of anal spines	11	11	11	11	11
Number of anal rays	9	9	8	10	9

46. INIMICUS AURANTIACUS (Schlegel).

AKAOKOZE (RED POISON-FISH).

Pelor aurantiacum Schlegel, Fauna Japonica, Poiss., 1843, p. 44, pl. xviii, fig. 1; Nagasaki.—Günther, Cat. Fish, II, 1860, p. 151, copied.

Head $2\frac{5}{6}$ in length without caudal; depth $3\frac{1}{3}$; dorsal XVII, 7; anal II, 9. Lateral line with 15 pores (or tentacles). Eye 7 in head; maxillary $2\frac{1}{6}$.

Upper profile of head deeply concave from first dorsal spine to posterior end of produced premaxillary processes, the eye much produced above level of rest of profile. Mandible with a knob at symphysis. Snout very broad, the distance across maxillaries just behind angle of mouth $1\frac{1}{2}$ to $1\frac{3}{5}$ in length of head. Teeth on mandible in a broad band in front, very narrow at the sides; on premaxillaries much wider at sides and about equal in front to band on front of mandible; on vomer in a band as wide as on front of jaws; palatines toothless.

Top of head with many blunt spines and ridges, much lower than in *Inimicus japonicus*. A rather sharp ridge across posterior part of interorbital separating interorbital space from a transverse depression across occipital region, which is somewhat more shallow than interorbital space. A couple of spines on occipital region (probably on parietals), a third farther back and slightly out of line with them, and a pair behind posterior margin of eye on a level with lateral line. A spine on middle of preorbital and 2 on its lower edge, the posterior of which is the larger. One on suborbital just below deep depression in front of eye, and a pair below eye slightly before its middle, one placed above the other. Opercle with 2 small spines and a row of 3 or 4 around preopercle. A row of multifid dermal fringes around preopercle extending around lower side of mandible; the largest of these at side of mandible and at end of maxillary. A couple of small dermal flaps on preorbital and several on lower edge of opercle. A row of dermal flaps along lateral line and above it a row of shorter wart-like ones placed about half as frequently. The dorsal spines decorated with numerous tentacles.

Pectoral reaching to front of anal or a little past, 10 rays without the 2 detached ones all branched, the lower 4 appearing simple. Ventrals adnate for their whole length, the membrane extending past the tip of the last nearly to the front of anal. Anal spines entirely covered with skin, their points not free; the tips of the posterior rays reach to the base of caudal. Front of dorsal placed from tip of snout a distance contained 4 times in entire length without caudal. Caudal rounded.

Color in spirits of one specimen is entirely white (bright orange in life) with the exception of 5 or 6 black spots the size of pupil scattered irregularly over each side and not placed the same on opposite sides; 3 or 4 similar spots on inner surface of pectoral. This specimen in life was bright yellowish orange.

Another specimen is slightly dusky on back and has several regularly placed irregular dark brown blotches; interorbital space and preocular pits uniform dark brown; a similar colored area on opercle and preopercle, leaving a light area behind eye and on cheek; another dark brown one on back above lateral line below third to fifth dorsal spines; one just below the last and behind base of pectoral, one at tip of pectoral and one under soft dorsal rays extending on soft

dorsal; all dermal flaps dark brown; lips and maxillary dusky; pectoral dark at middle, lighter below and behind, a few black spots on under surface; ventrals, caudal, and anal dusky; belly and lower parts sparsely freckled with slightly diffused spots, not so large, black, or clear-cut as on the other specimen. This specimen in life, where not dark brown, was golden yellow.

We have two specimens from Hiroshima and Kobe, 24 and 28 cm. in length.

The species is much less common than *Inimicus japonicus*.

(*aurantiacus*, orange color.)

Measurements of Inimicus aurantiacus.

Locality.	Kobe.	Hiroshima.
Length in millimeters without caudal	205	180
Head in hundredths of length	36	37
Depth	30	31
Eye	5	5½
Maxillary	17½	17¾
Interorbital width	9	8
Width of snout across maxillaries	23	22
Length of pectoral	38	36
Length of third dorsal spine	17	17
Length of caudal	28	29
Number of dorsal spines	XVII	XVII
Number of dorsal rays	7	7
Number of anal spines	II	II
Number of anal rays	9	9

19. OCOSIA Jordan and Starks.

Ocosia Jordan and Starks, new genus (*vespa*).

Body compressed, elevated, covered with smooth skin. Head pointed, rather small; mouth small, little oblique; teeth on vomer and palatines; preorbital, with a long curved spine reaching nearly to the tip of the maxillary; small spines on top and sides of head; preopercle with 4 spines; spinous dorsal high, continuous, beginning above middle of eye, of 16 spines and 9 soft rays; anal rays III, 6. Ventral rays I, 5; pectoral without free rays. Small fishes of rather deep water in Japan, differing from *Agriopus* in lacking the preopercular spine and in having 3 spines in the anal.

(*okoze* or *okose*, the Japanese name for venomous Scorpænoid fishes.)

47. OCOSIA VESPA Jordan and Starks, new species.

Head 2¾ in length without caudal; depth 2½. Dorsal XVI, 9; anal III, 6. Ventral rays I, 5. Lateral line with 12 or 13 pores. Eye 4 in head; maxillary 2¾.

Anterior profile from first dorsal spine to tip of snout nearly straight and rather steep, a notch between eye and premaxillary processes. Mouth scarcely oblique and below axis of body; the maxillary reaching to below middle of eye. Lower jaw very slightly projecting, and

without a symphyseal knob; teeth in moderate bands on jaws; in narrow bands on vomer and palatines. Interorbital narrow in front, equal to half the diameter of eye, increasing to twice that width over middle of eye. Superorbital rim raised in a slight crest, with a pair of ridges between, which diverge posteriorly. Posterior end of preorbital armed with a long, sharp, curved spine, which reaches nearly to tip of maxillary; anterior lower edge with a very small spine inclined back and downward. A pair of spines on upper part of head in line with superorbital rim, and a couple behind eye in line with anterior end of lateral line. Suborbitals with a broken ridge, but without spines, ending in upper preopercle spine. Preopercle with 4 spines and traces of a fifth below; long and sharp above, growing evenly and gradually shorter below. Last gill arch without a slit

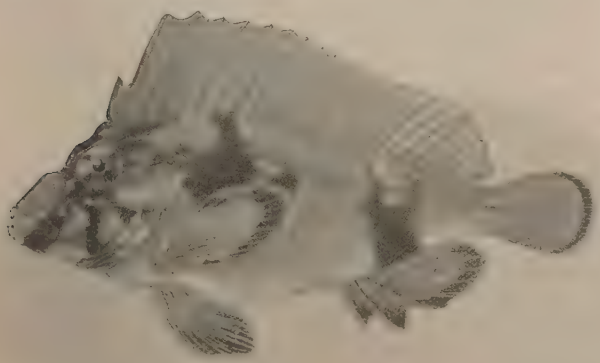


FIG. 17.—OCOSIA VESPA.

behind. Gill rakers rudimentary, represented by 4 or 5 small tubercles.

No notch between soft rays and spines of dorsal. Spinous dorsal very high; its origin above middle of eye; its first spine equal in length to orbit and contained $2\frac{2}{3}$ times in second; the anterior (except the first) spines the longest, decreasing gradually, but very slightly, in length to the last, which is shorter than second spine from one-half to four-fifths eye. Soft dorsal rays scarcely, or very slightly, longer than posterior spines, decreasing quickly in length behind middle rays; the last ray adnate to body and reaching a little past base of caudal. Pectoral reaches beyond tips of ventrals, but scarcely to front of anal; it has 12 rays, the fifth or sixth from the top the longest. Ventrals with spine and 5 rays, their tips scarcely reaching to vent. First anal spine equal in length to diameter of eye, and contained $1\frac{1}{3}$ in third spine; second spine intermediate in length. Second anal ray the long-

est, 2 in head; last ray not adnate to body. Body and head everywhere without scales.

Color in spirits, brownish or dusky irregular cross bars over a white ground; one downward under seventh dorsal spine, broader below lateral line and inclosing a white spot just below it, fading on lower part of sides; the next under last spine and first 4 or 5 rays, extending nearly to anal; a narrow band across base of caudal, and one across rays toward their tips; extreme tips white; dorsal without color, except a little dusky at end of soft dorsal; anal and tips of ventrals dusky; pectoral with a broad white band across middle of rays, a black band toward tips, and extreme tips white; a dusky spot on nape; a dark stripe from eye to upper preopercle spine, one obliquely across cheek, and one forward across maxillary and mandible; snout and tip of mandible white; a dusky band covered with small black points across interorbital space. Other specimens have small dark points on front of dorsal, base of pectoral, and on head following the radiating lines from eye. Sometimes entire dorsal is more or less spotted. One specimen shows traces of pink above lateral line and on head. In life the species was pink or pinkish gray with darker markings.

Specimens were dredged by the U. S. Fish Commission steamer *Albatross* in 40 to 50 fathoms in Sagami Bay. Stations 3757, off Sano Point, Sagami Bay, 41 to 50 fathoms; 3762, same locality, 42 to 49 fathoms, and 3764, same locality, 44 to 50 fathoms. They do not exceed 50 mm. in length.

The types are in the U. S. National Museum and are numbered 50911. Cotypes are numbered 7375 and 7376 Leland Stanford Junior Ichthyological collection.

(*vespa*, wasp.)

20. SNYDERINA Jordan and Starks.

Snyderina Jordan and Starks, Proc. Cal. Acad. Sci., 1901, p. 381 (*yamanokami*).

Body robust, compressed, sparsely covered with nonimbricate, thickened or granular scales. Head naked, ridged, without cranial spines. Profile angulated in front of eye; preorbital with a long sharp spine. Preopercle with a long sharp spine above and 4 smaller ones. Teeth villiform, in bands on jaws and vomer; palatines toothless. Gill-membranes narrowly united and narrowly connected with the isthmus. No slit behind fourth gill. Branchiostegals 7. Lateral line present. Dorsal continuous, with about 13 spines and 10 rays. Anal with 3 spines. First dorsal spine short, inserted above middle of eye; last dorsal ray adnate to caudal peduncle. Ventral rays I, 5. Pectoral without free ray. Caudal rounded. Fins all scaleless.

This genus is close to *Tetraroge* (*barbatus*), differing at least in the absence of barbels at the chin.

(Named for John Otterbein Snyder.)

48. SNYDERINA YAMANOKAMI Jordan and Starks.

YAMA-NO-KAMI (MOUNTAIN WITCH).

?*Tetraroge güntheri* Boulenger, Proc. Zool. Soc. London, 1889, p. 239, with plate; Muscat, Arabia (palatines said to have teeth).

Snyderina yamanokami Jordan and Starks, Proc. Cal. Ac. Sci., 1901, p. 381, pl. xx; Kagoshima, Japan.

Head 2.6 in body; depth 2.7; eye 4 in head; maxillary 2.5. Dorsal XIII, 10; anal III, 5. Pores of lateral line 21.

Body compressed, the back elevated anteriorly, deepest over posterior part of head, tapering to a rather small caudal peduncle.

Head with many spines and ridges, the ridges smooth and covered with thin skin. Profile very steep from first dorsal spine to snout,

Fig. 18.—Snyderina yamanokami.

which latter projects at a sharp angle and is less nearly vertical. Mouth very oblique, the lower jaw slightly projecting. Maxillary broad at the posterior end, transversely concave. Teeth finely villiform, in bands on jaws and vomer; palatines toothless. Width of interorbital space about two-thirds diameter of eye. Two nearly parallel high sharp ridges run from first dorsal spine to snout. A ridge around anterior margin of eye runs backward to beneath base of third dorsal spine; it has a depression above middle of eye and another above posterior part of eye. Superior margin of eye with a ridge which is scarcely continuous with that of anterior margin. From behind eye, about on a level with superior margin of pupil, a broken horizontal ridge extends backward above gill-opening nearly to tip of opercular flap. Suborbital stay with a sharp, smooth ridge extending back and joining at right angles a ridge that follows around margin of preopercle. From the latter and below its junction with suborbital ridge

the preopercle sends a ridge backward which ends in a sharp spine. Preorbital with a short spine anteriorly projecting transversely to maxillary; a long sharp spine follows upper contour of maxillary and is as long as half the diameter of eye. Gill-rakers short, blunt, uneven; about 4+8 in number.

Entire head, a space on back below dorsal, breast, and a space behind base of pectoral, naked. Sides of body covered with small granulations which are somewhat thickened toward their posterior margins, but are not spiniferous.

Dorsal without a notch between the spinous and rayed portions. The first spine not longer than eye (its tip broken), its base above middle of eye. The second spine over twice as long as the first; the fifth equal to distance from eye to tip of opercular flap. The middle rays of soft dorsal longest; their length equal to the distance from tip of snout to preopercular ridge; the posterior margin of the fin straight, forming an angle slightly less than a right angle with the superior margin. The last ray is adnate to the caudal peduncle for its whole length, the membrane not quite reaching to base of caudal.

The anal spines are graduated; the first scarcely as long as diameter of eye, the third twice the length of the first. When the fin is depressed the tips of the middle rays reach the base of the caudal. The last ray is adnate to the caudal peduncle for about half its length. When ventral fins are depressed the longest ray reaches to the base of the first anal spine, while the tip of the ventral spine falls short of it a distance equal to the diameter of the eye. Pectoral angulated, the sixth and seventh rays longest, reaching to above the first anal ray. Caudal fin narrow and elongate, with the posterior margin rounded; its length 1¼ in head.

Color (from a specimen long in spirits) slaty white with brownish markings. Membrane of spinous dorsal clouded with brownish; some of the spines with a small, dark spot in front of them. All of the other fins with vermiculated markings transversely across the rays. A large dark-brown spot behind upper part of gill-opening and a smaller one on lateral line below base of last dorsal spines. Eye with traces of lines radiating from the center.

The type is a single specimen (No. 6433 on the Stanford Museum Register) in good condition, 217 mm. long, presented to Stanford University by Professor Mitsukuri of the Imperial University of Tokyo. It is said to be from Kagoshima in Kiusiu, and to bear the local name of Yama-no-kami, or Mountain Goddess, in local mythology a woman with wings, capable of starting a storm. Dr. Boulenger calls our attention to the probable identity of this species, with his *Tetrarogè güntheri*. The two agree in form and color, but *S. guntheri* is said to have palatines toothed and there is some difference in size of mouth.

21. PARACENTROPOGON Bleeker.

Paracentropogon Bleeker, Act. Sci. Roy. Amst., 1876, p. 66, (*longispinis*).

Body oblong, compressed, covered with minute scales or almost naked. Head obtuse, without spinous crests. Preorbital with two spines, preopercle with 4 or 5; opercle with 2; mouth moderate, oblique, the jaws subequal; teeth on vomer and palatines; no barbels at the chin; gills 3½, no slit behind the last; pectorals moderate, without free rays; dorsal continuous, not joined to the caudal, the spines 12 to 14, the first inserted over the eye, the anterior spines strong and divergent; soft rays 8 or 9; ventral rays I, 4; anal rays III, 4 to 6; caudal rounded. Small brightly colored fishes, with stinging spines. They are distinguished from the genus *Tetraroge* chiefly by the absence of barbels. From *Gymnapistus* (*Pentaroge*) the absence of a slit behind the last gill is the chief distinction. Both *Tetraroge* and *Gymnapistus* are said to have the ventral rays I, 5, but Valenciennes incorrectly assigns the same number to *Paracentropogon longispinis*.

(παρά, near; *Centropogon*, a related genus; κέντρον, spine; πογών, beard.)

49. PARACENTROPOGON RUBRIPINNIS (Schlegel).

OKOZE.

Apistus rubripinnis Schlegel, Faun. Jap. Poiss., 1843, p. 49, pl. xxii, fig. 2; Nagasaki.

Tetraroge rubripinnis Günther, Cat. Fish. Brit. Mus., II, 1860, p. 133; after Schlegel.—Ishikawa, Prel. Cat., 1897, p. 50; Boshu, Misaki.—Jordan and Snyder, Check List Fishes Japan, 1901, p. 100; Yokohama.

Tetraroge longispinis Steindachner, Fische Japans, III, 1884, p. 29; Tokyo, Tagawa, Tango, not of Cuvier and Valenciennes, a species from Amboina, found also in China.

Paracentropogon longispinis Steindachner, Reise Aurora, 1897, p. 203; Kobe, Hiogo.

Tetraroge longispinis var. *nuda* Günther, Shore fishes Challenger, 1880, p. 66; Kobe, Japan.

Head 3 in length without caudal; depth 2⅔. Dorsal XIV, 7; anal III, 4 or 5, usually 4. Ventral ray I, 4. Eye 3½ in head; maxillary 2¾; interorbital 5¼. Lateral line with 20 pores.

Anterior profile of head very steep and very slightly convex from first dorsal spine, which is above middle of eye, to tip of snout. Mouth moderately oblique, the front of premaxillaries on a level with lower margin of eye. Maxillary reaching to below middle of eye. Jaws equal, the lower with a slight knob at symphysis. Broad bands of villiform teeth on jaws, vomer and palatines; the bands on premaxillaries broader than on mandible, those on palatines short in comparison with their breadth. Interorbital space rather narrow, its edges converging anteriorly, and having a pair of large ridges which

diverge anteriorly; the superorbital ridge is somewhat raised, and were the interorbital ridges absent, the interorbital space would be concave. Preopercle with a large, sharp spine at its edge on a level with suborbital stay, and 3 or 4 slight, sharp tubercles covered with skin on its edge below. A long sharp spine on posterior edge of preorbital reaches backward past end of maxillary nearly to below posterior orbital margin, and a small spine at its base, which is directed downward. Anterior limb of first gill arch with 8 or 9 very short blunt gill-rakers. Pseudobranchiæ present. Gills $3\frac{1}{2}$, no slit behind the last.

Pectoral reaching past tips of ventrals to opposite vent; pectoral rays 11, all branched. Dorsals without a notch between them; the first spine less than half the length of second; second and third subequal $1\frac{1}{4}$ to $1\frac{1}{5}$ times in head, the third to sixth decreasing in length backward and the remaining ones subequal, the last spines two times

FIG. 19.—PARACENTROPOGON RUBRIPINNIS.

in head, and equal to the longest rays; last dorsal ray connected to body for nearly its full length by a membrane. (These measurements taken from a specimen 10 cm. in length.) In specimens 6 cm. in length the first spine is longer in comparison with second, which latter is equal to half head, and the posterior spines behind the fourth are subequal in length and contained $2\frac{1}{2}$ times in head. Third anal spine longer, but equal to second in diameter; its length $2\frac{1}{6}$ in head.

Head and body appearing to the naked eye and to the touch naked; under a lens, however, the posterior part of the body is seen to be sparsely covered with small, round, embedded, nonimbricated scales, in greater or fewer numbers (sometimes entirely absent) and not always of the same size; these not developed anterior to the tip of the pectoral.

Color in spirits: Sides and backs mottled and spotted with small irregular dark-brown or black spots, sometimes arranged to form very

much broken and irregular crossbars; when these are evident, there is one under front of soft dorsal, one under posterior part of soft dorsal and on caudal peduncle, one across body under pectoral, one at nape, and one across interorbital space. Radiating bars commonly present from eye; these extending on iris nearly to pupil, leaving a narrow silvery ring of the iris around pupil; one downward across maxillary, one downward across cheek, one downward and backward to preopercle spine, one upward and backward toward base of second dorsal spine. A spot usually of the light ground color present just above or resting on lateral line, situated at a point midway between tip of snout and middle of caudal rays; sometimes it is made conspicuous with opaque white pigment especially in females. Rays of soft fins crossed with narrow wavy lines, except ventrals, which are white with dusky tips. Spinous dorsal irregularly marbled; a large deep black blotch from sixth to ninth ray, extending slightly on back. Peritoneum white.

A fresh specimen showed the following color: Olive spotted with darker olive; a jet-black spot on back; lower fins and belly rosy; dorsal blotched with brownish red, a pale spot above lateral line. The coloration is subject to great variation in degree of mottling. The females are rather duller in color and with lower spines.

This description is based on many specimens from Tokyo, Tomo in Bingo, Misaki, Kobe, and Wakanoura.

According to Dr. Günther, this species (which he calls var. *nuda*) is distinguished from *Paracentropogon longispinis* of the East Indies by the virtual absence of scales.

(*ruber*, red; *pinna*, fin.)

22. ERISPHEX Jordan and Starks.

Erisphex Jordan and Starks, new genus (*pottii*).

Body oblong, compressed, scaleless, but covered with velvety prickles. Head without spines or rough crests above; preorbital with 2 spines below; preopercle with 3 or 4 blunt spines, opercle with 2 spines; mouth moderate; teeth on the vomer, none on the palatines. Dorsal fin continuous, notched after the third or fourth spine, beginning over the eye, of 11 to 13 spines and 9 to 11 soft rays; pectorals rounded, without free rays; anal with 2 spines and 8 to 10 soft rays; ventral rays I, 2, or I, 3.

Small fishes of the East Indies, ranging northward to Japan. From *Centropogon* Kaup (*echinatus*), the most nearly related genus, the Japanese genus differs in the presence of but 1 or 2 soft rays in the ventrals instead of 5.

(ἔρι, very; σφέξ, wasp.)

a. Dorsal rays XI, 13; the 3 anterior spines set off by a notch; maxillary reaching to opposite middle of eye ..... *pottii*, 50.

aa. Dorsal rays XI, 11, 10; the 4 anterior spines set off by a notch; maxillary barely reaching front of eye ..... *kagoshimensis*, 51.

50. ERISPHEX POTTII (Steindachner).

Cocotropus pottii STEINDACHNER, Reise der Aurora, 1897, p. 203, pl. IV, fig. 1; Kobe.—JORDAN and SNYDER, Check List, 1901, p. 101; Yokohama.

Head 3½ in length without caudal; depth 2⅝. Dorsal XI, 13; anal II, 10. Ventral I, 2. Lateral line with 14 pores. Eye 4 in head; maxillary 2.

Upper profile of head nearly uniformly convex from first dorsal spine to tip of snout, a slight notch between slightly produced processes from premaxillaries and superorbital rim. Mouth very oblique, more nearly vertical than horizontal. Lower jaw bluntly rounded and strongly projecting. Anterior end of premaxillaries on a level with lower margin of pupil; maxillary reaching to below middle of eye. Teeth in moderate bands on jaws, growing wider in front; the patch on vomer narrower than on jaws, widest at the middle; palatines toothless. Interorbital slightly concave; 4½ in head; a high median ridge divides anteriorly and surrounds a pit behind premaxillary processes, posteriorly it stops at a slight transverse depression just in front of dorsal. Preorbital with 2 spines, the posterior much the larger, nearly reaching to end of maxillary, the anterior small and pointing downward and outward. Preopercle with 4 spines, the upper one the largest, the others growing gradually smaller below. A blunt spine or tubercle at upper posterior edge of eye, another behind it opposite base of third dorsal spine; 2 similar ones behind eye on a level with beginning of lateral line. A slight ridge on suborbitals extending obliquely across cheek to upper preopercle spine.

No slit behind last gill arch; gill-rakers with slight tubercles, 5 or 6 of them below angle of first arch. Head and body, base of pectoral, and base of dorsal and anal covered with soft hair-like papillæ.

Fin rays all simple. Pectoral with 12 rays, the third from the top the longest, reaching to front of anal or a little past. Ventrals with 1 spine and 2 rays, their length equal to combined length of snout and eye. Anterior 3 spines of dorsal separated from rest of fin by a notch; the first spine a little behind middle of eye, its length 2⅛ in head, or equal to the second; no notch between dorsal spines and rays; the latter a little higher than the former; last dorsal ray adnate to caudal peduncle; tips of last ray reaching base of caudal. Anal a little lower than caudal and ending opposite to it; its origin midway between tip of mandible and middle of caudal rays. Caudal rounded.

Color in spirits: Uniform brownish on back and sides, or the color broken up into diffused spots as large as eye; belly lighter; fins usually darker than body, and darker toward ends of rays, though sometimes they are as light as body and have similar diffused spots; pectoral darker toward tips of rays, the extreme tips white; inner surface of pectoral similar to outer; tips of caudal rays white.

Of this species we have numerous specimens, the longest 85 mm. in length. These were taken at Tokyo, Wakanoura, and Matsushima Bay, Station 3771, off Doumiki Point in 61 fathoms.

(Named for Constantine von Pott, captain of the *Aurora*.)

51. ERISPHEX KAGOSHIMENSIS (Ishikawa).

Tetraroge dermacanthus Ishikawa, Prel. Cat., 1897, p. 50; Kagoshima, not of Bleeker.

Tetraroge kagoshimensis Ishikawa, Notes on species of fishes new to Japanese waters. (MSS., 1902; Kagoshima.)

"D. IV, IX, 10; A. I. 9; V. I, 3.

"Skin studded with small prickles. Snout slightly longer than eye, which is equal to interorbital space. Lower jaw projecting; maxillary not quite reaching orbit; no barbels. Dorsal fin beginning over posterior edge of eye, the four anterior spines partly separated from the others; second and third spines longest. About 9 groups of larger prickles along the lateral line. Color, in spirits, sepia brown, with faint irregular markings of darker color. Type, a single specimen from Kagoshima 84 mm. in length; head 28 mm. in length; snout 10; eye 7.5; first dorsal spine 10, second 11; pectoral 21; ventral 15; greatest depth of body 33." (Ishikawa MS.)

This specimen, No. 869, in the Imperial Museum of Tokyo, was examined by us. It is close to *Erisphex dermacanthus*, but apparently distinct from *E. pottii*. It is distinguished by the partial separation of the first four dorsal spines.

23. APLOACTIS Schlegel.

Aploactis Schlegel, Fauna Japonica, Poiss., 1843, p. 51 (*aspera*).

Aploactisoma Castelnau, Proc. Zool. Soc. Victoria, II, 1872, p. 64 (*schomburgki* a species with 5 detached spines).

Head and body compressed, studded with small prickles; bones of the head with obtuse prominences; preorbital without spine; mouth moderate, with teeth on vomer; none on palatines. Dorsal fin beginning anteriorly with 14 spines and 11 to 14 soft rays; the 3 anterior spines detached from the others; anal long, without distinct spines; ventral rays 1, 2. Pectorals moderate, without free-ray; caudal rounded.

Japan and East Indies.

(ἁπλοός, simple; ἄκτις, ray.)

52. APLOACTIS ASPERA Richardson.

Aploactis Schlegel, Fauna Japonica, Poiss., 1843, p. 51, pl. xxii, fig. 3; Nagasaki.

Aploactis aspera Richardson, Voy. Sulphur, Fishes, 1846, p. 72; China. Günther, Cat. Fish. II, 1860, p. 142; Japan. Steindachner and Döderlein, Fische Japans, IV, 1884, p. 197; Kagoshima.

Head 3¾ in length without caudal; depth 3⅓. Dorsal III, XI, 12; anal 13. Ventral 1, 2. Lateral line with 12 pores. Eye 4½ in head; maxillary 2½.

The supraorbital rim is but little produced, leaving the upper profile of head nearly uniformly convex from first dorsal spine to tip of snout; there is a slight notch in front and behind eye. Mouth very oblique; the anterior end of premaxillary is slightly above the level of middle of eye; the maxillary scarcely reaches to below anterior margin of pupil. Lower jaw bluntly rounded and projecting. Teeth in broad bands on jaws, narrower on vomer, palatines toothless; bands on premaxillaries not widened in front, those on mandible very slightly widened. Interorbital with a pair of ridges slightly raised above superorbital rim and having a wide shallow depression between, which is closed behind by a transverse ridge bounding a slight transverse depression across head in front of first dorsal spine. Superorbital rim uneven and continuous posteriorly with a broken, very crooked ridge; just below which are a couple of blunt tubercles forming a broken ridge from upper posterior border of eye. Suborbitals with a

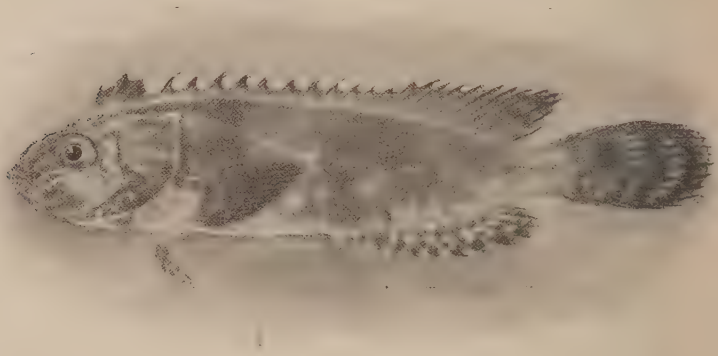


FIG. 20.—APLOACTIS ASPERA.

blunt, crooked ridge ending in the upper preopercle spine. Preorbital ending posteriorly in a pair of very blunt, short spines and having a similar spine on its anterior edge, which points down and forwards. Preopercle with 5 spines, all blunt, the upper one the largest, the others growing gradually smaller below. Opercle with 2 blunt spines at the ends of slight ridges. Last gill arch without a slit behind it. Gill rakers scarcely developed; 5 or 6 slight tubercles below angle of first arch.

Head and body completely covered with coarse, rather soft papillæ, which vary in size and abundance on different specimens; sometimes they are rather fine and scattered on head, and the blunt cranial spines and ridges stand out prominently, sometimes they are so coarse and abundant as to obscure the spines more or less.

Pectoral reaching to opposite vent, its border rounded, having 13 simple rays. Ventrals short and with 1 spine and 2 rays, their length

2 in head. The first 3 spines of dorsal separated from succeeding spines; no notch between spines and rays, and as rays are all simple it is difficult to distinguish spines from rays. Dorsal base ending just in front of caudal base. Anal not reaching so far back as dorsal; its insertion midway between tip of mandible and posterior third of caudal.

Color slate or brownish, usually lighter below, but not always; sides sometimes with fine black spots; fins all black or dark slate color, sometimes showing black cross lines, particularly on pectoral; tips of pectoral rays and dorsal rays and spines light. This description is based on 6 specimens from Nagasaki, the longest 95 mm. in length. The species is apparently rather rare.

(*asper*, rough.)

SUMMARY.

Family Scorpænidæ.

1. *Sebastolobus* Gill.

1. *macrochir* (Günther); Miyako, Misaki, Nemuro, Sagami Bay.

2. *Sebastodes* Gill.

2. *glaucus* (Hilgendorf); Bering Island.
3. *taczanowskii* (Steindachner); Otaru, Mororan, Iwanai, Aomori, Samé.
4. *itinus* Jordan and Starks; Hakodate.
5. *steindachneri* (Hilgendorf); Hakodate.
6. *güntheri* Jordan and Starks; Misaki, Wakanoura, Hakodate.
7. *inermis* (Cuvier and Valenciennes); Hakodate, Matsushima, Tokyo, Misaki, Enoshima, Kobe, Onomichi, Hiroshima, Wakanoura, Nagasaki, Tsushima.
8. *tokionis* Jordan and Starks; Misaki, Tokyo, Wakanoura, Tsuruga.
9. *joyneri* (Günther); Aomori, Miyako, Tokyo.
10. *matsubaræ* (Hilgendorf); Misaki.
11. *iracundus* Jordan and Starks; Kushiro.
12. *flammeus* Jordan and Starks; Misaki.
13. *scythropus* Jordan and Snyder; Misaki, Tokyo.
14. *fuscescens* (Houttuyn); Tokyo, Nagasaki, Otaru, Iwanai, Aomori, Samé, Mororan, Hakodate.

3. *Sebastichthys* Gill.

15. *owpas* (Steindachner and Doderlein); Hakodate, Samé, Miyako near Morioka.
16. *nivosus* (Hilgendorf); Samé, Misaki.
17. *trivittatus* (Hilgendorf); Aomori, Kushiro.
18. *oblongus* (Günther); (not seen).
19. *matsubaræ* (Cramer); Hakodate, Aomori Matsushima, Tokyo, Yokohama, Onomichi, Kobe, Nagasaki.
20. *pachycephalus* (Schlegel); Wakanoura, Kobe, Hiroshima, Shimonoseki.
21. *elegans* (Steindachner and Doderlein); Misaki, Onomichi, Miyajima.

4. *Neosebastes* Guichenot.

22. *entaxis* Jordan and Starks; Misaki, Chosu.

5. *Thysanichthys* Jordan and Starks.

23. *crossotus* Jordan and Starks; Suruga Bay.

6. *Sebastiscus* Jordan and Starks.

24. *marmoratus* (Cuvier and Valenciennes); Hakodate, Samé, Tokyo, Misaki, Sagami Bay, Enoshima, Suruga Bay, Kobe, Hiroshima, Wakanoura, Nagasaki.
25. *albofasciatus* (Lacépède); Tokyo, Misaki, Awa, Wakanoura, Nagasaki, Suruga Bay, Totomi Bay.

7. *Helicolenus* Goode and Bean.

26. *dactylopterus* (De la Roche); Misaki, Awa, Sagami Bay, Suruga Bay.
27. *emblemarius* Jordan and Starks; Okinose, Misaki.

8. *Scorpæna* (Artedi) Linnæus.

28. *fimbriata* Döderlein; Wakanoura, Kobe, Misaki, Tokyo.
29. *miostoma* Günther; (not seen.)
30. *onaria* Jordan and Snyder; Tokyo.
31. *izensis* Jordan and Snyder; Suruga Bay, Sagami Bay, Totomi Bay.

9. *Scorpænopsis* Heckel.

32. *cirrhosa* (Thunberg); Wakanoura, Nagasaki.
33. *kagoshimana* (Steindachner and Döderlein); not seen.

10. *Setarches* Johnson.

34. *albescens* (Steindachner and Döderlein); Misaki, Totomi Bay.

11. *Lythrichthys* Jordan and Starks.

35. *eulabes* Jordan and Starks; Suruga Bay.

12. *Pterois* Cuvier.

36. *volitans* (Linnæus).
37. *lunulata* Schlegel; Tokyo, Yokohama, Wakanoura, Misaki.

13. *Ebosia* Jordan and Starks.

38. *bleekeri* (Steindachner and Döderlein); Tokyo.

14. *Apistus* Cuvier.

39. *evolans* Jordan and Starks; Tokyo.
40. *venenans* Jordan and Starks; Nagasaki.

15. *Minous* Cuvier and Valenciennes.

41. *adamsi* Richardson; Kobe, Onomichi, Wakanoura, Nagasaki.
42. *echigonius* Jordan and Starks; Niigata.

16. *Decterias* Jordan and Starks.

43. *pusillus* (Schlegel); Wakanoura.

17. *Erosa* (Swainson) Jordan and Starks.

44. *erosa* (Langsdorf); Misaki.

18. *Inimicus* Jordan and Starks.

45. *japonicus* (Cuvier and Valenciennes); Tokyo, Onomichi, Yokohama, Kobe.
46. *aurantiacus* (Schlegel); Hiroshima, Kobe.

19. *Ocosia* Jordan and Starks.

47. *vespa* Jordan and Starks; Sagami Bay.

20. *Snyderina* Jordan and Starks.

48. *yamanokami* Jordan and Starks; Kagoshima.

21. *Paracentropogon* Bleeker.

49. *rubripinnis* (Schlegel); Tokyo, Tomo, Misaki, Kobe, Wakanoura.

22. *Erisphex* Jordan and Starks.

50. *pottii* (Steindachner); Tokyo, Wakanoura, Matsushima Bay.
51. *kagoshimenis* (Ishikawa); Kagoshima.

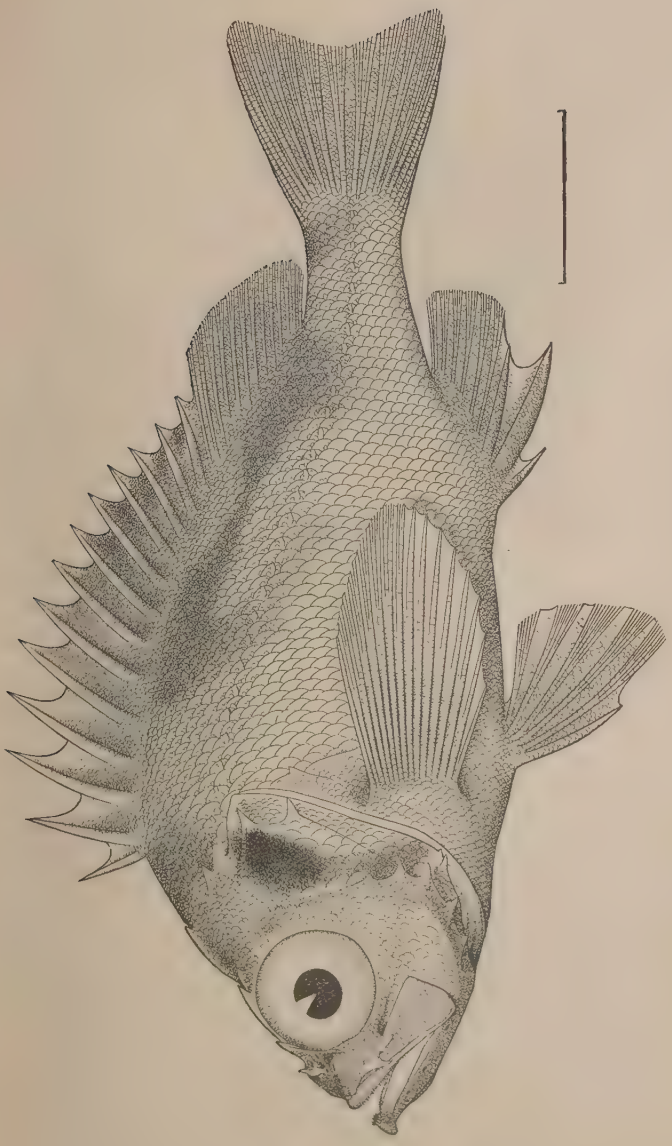
23. *Aploactis* Schlegel.

52. *aspera* Richardson; Nagasaki.

NOTE.

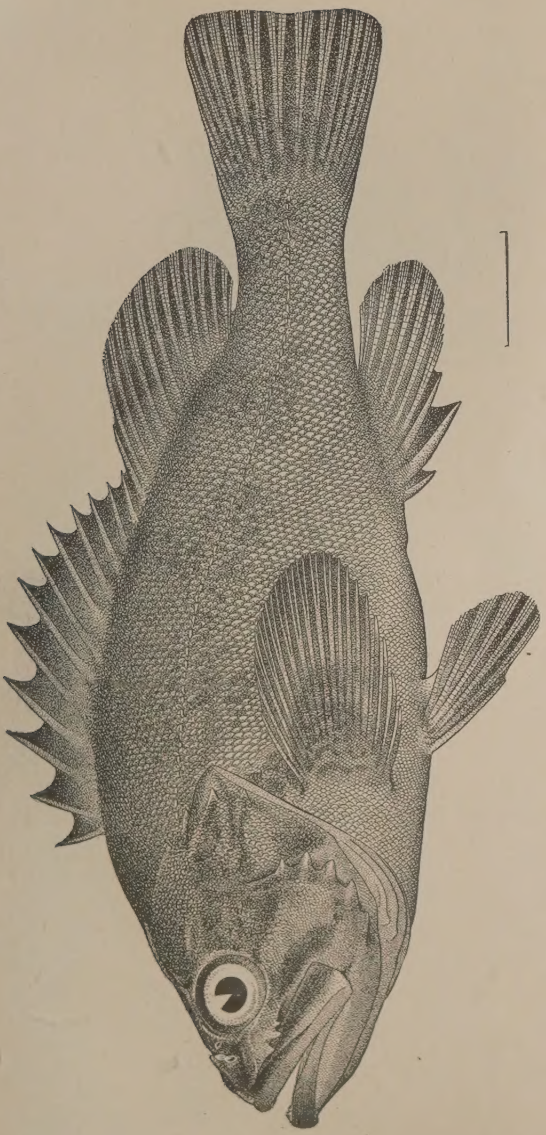
The *Sebastodes flammeus* described on page 108 is known only from a single specimen in very poor condition, and no satisfactory illustration could be made. An outline drawing is here given which errs in representing the lowermost pectoral rays branched; there are eight simplex ones as described.

FIG. 21.—SEBASTODES FLAMMEUS.



SEBASTODES SCYTHROPUS.

FOR EXPLANATION OF PLATE SEE PAGE 109.



SEBASTODES FUSCESCENS.

FOR EXPLANATION OF PLATE SEE PAGE 110.